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THE WILSON BULLETIN

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DOWNY

♂ JUVENILE (FLIGHTLESS) ♀

♂ JUVENILE (IN JUVENILE PLUMAGE) ♀

♂ JUVENILE (IN FIRST WINTER PLUMAGE) ♀

♂ ADULT (IN WINTER PLUMAGE) ♀

♂ ADULT (IN ECLIPSE PLUMAGE) ♀

BLACK DUCK

(Anas rubripes)

UNIV. OF MICH.

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THE WILSON BULLETIN
A QUARTERLY MAGAZINE OF ORNITHOLOGY
Published by the Wilson Ornithological Club

Vol. 55 MARCH, 1943 No. 1

CORRELATION OF BILL AND FOOT COLORING WITH AGE AND SEASON IN THE BLACK DUCK

BY TERENCE M. SHORTT

SPORTSMEN and ornithologists have long been familiar with two distinct types of coloration in the bill and feet of the Black Duck *(Anas rubripes)*, and many have published their interpretations (Brewster 1902, 1909, 1910; Townsend 1905, 1912; Dwight 1909; Phillips 1920; Bent 1923; *et al.*). Some believed that the differences were due to age and to seasonal changes; others that the variants represented two geographic races. In the present A.O.U. Check-List the latter interpretation is accepted.

The greatest difficulty in ascertaining the significance of this color variation has been in making an exact age determination for individual birds. Young birds, once they had moulted from the juvenile to the first winter (or nuptial) plumage, were not distinguishable from older birds. This difficulty was overcome by Gower (1939), who found that the bursa of Fabricius was an age indicator. This sac-like organ is attached to the dorsal side of the large intestine and opens into the cloacal chamber near the anus. It is believed not to be present in adult birds except in the ostriches, but is present in all juveniles. Apparently

PLATE 1. BILL AND FOOT COLORING OF THE BLACK DUCK

DOWNY: ♂ June 6, 1942, Kabiskaubakau River, Ontario (west coast of James Bay). The sexes appear to be essentially alike.

JUVENILE (FLIGHTLESS): ♂ July 15, 1942, Fort Albany, Ontario (west coast of James Bay). Much down still adhering to back and rump.
♀ July 9, 1931. Laird, Algoma District, Ontario. Much down still adhering to back and rump.

JUVENILE (IN JUVENILE PLUMAGE): ♂ July 23, 1942, Big Piskwanish, Ontario (west coast of James Bay). Fully feathered and flying.
♀ September 17, 1941, Rice Lake, Ontario.

JUVENILE (IN FIRST WINTER PLUMAGE): ♂ December 1, 1941, Long Point, Lake Erie, Ontario.
♀ December 1, 1941, Long Point, Lake Erie, Ontario.

ADULT (IN WINTER PLUMAGE): ♂ November 30, 1941, Long Point, Lake Erie, Ontario.
♀ December 1, 1941, Long Point, Lake Erie, Ontario.

ADULT (IN ECLIPSE PLUMAGE): ♂ July 19, 1942, Nettichi River, Ontario, (west coast of James Bay).
♀ July 16, 1942, Nettichi River, Ontario, (west coast of James Bay).
(Note reversion to juvenile coloration.)

It should be remembered that there is considerable individual variation in the bill and foot coloring of this species. The illustration does not show these variations but rather is an attempt to portray the typical sequence of color change. The types of coloration shown are those most frequent in the series of freshly killed birds available for examination.

this sac, after complete development, is gradually absorbed and has disappeared entirely by the time a bird is sexually mature. In surface-feeding ducks the bursa appears to reach the height of development when the bird is approximately four months old, that is, in September or October. It is evident in all juveniles through November and December, is usually still discernible in February, sometimes in early March.

Hochbaum (1942) subsequently studied and further simplified age and sex determination by cloacal examination. Particularly useful is the comparison of the short, rudimentary penis of the juvenile male and the large, sheathed organ of the adult. The oviduct of the juvenile female is occluded; that of the adult shows as a conspicuous slit in the left cloacal wall.

Pirnie (see Kortright,1942: 170) made a careful study of the Black Duck and came to the conclusion that the variations in color of the unfeathered parts were due to sex and age. He pointed out that the coloration of the bill and feet was duller when adults were in the eclipse plumage than when they were in winter or nuptial plumage.

In the light of the information contained in the papers mentioned above, 38 Black Ducks taken in various places in Ontario have been critically examined. The colors of the unfeathered parts were carefully noted in relation to age, sex and seasonal variation of plumage.

Twenty-seven of these birds were in winter (or nuptial) plumage, having been taken in late November. By cloacal examination 16 were determined as males and 11 as females. Of the males four lacked any trace of the bursa and possessed the large sheathed penis of the adult. The remaining 12 had the bursa well developed (measuring 20 mm to 28 mm in length), and the copulatory organ of each was inconspicuous and rudimentary. These were obviously birds of the year which had just attained their first winter plumage. There was no trace of the more streaked juvenile plumage, and the only outward manifestation of immaturity was the presence of two juvenile tail feathers in each of two birds taken on November 30, 1941. These tail feathers were readily identified as of the juvenile plumage by the blunt tips of the shafts, which protruded some distance beyond the distal barbs, as described by Witherby (1924:270).

The bill coloration of the adult males was from Wax Yellow [1] to Lemon Chrome, faintly tinged with Olive at the base and on the terminal portion. The feet were red, ranging from Coral-Red to near Scarlet-Red. The other group, comprising the first winter males, showed bills varying in color from Light Yellowish Olive to Greenish Yellow and feet of Tawny to Apricot Orange.

In four of the 11 females examined the oviduct was visible and open, and the bursa had been absorbed, indicating maturity. The other

[1] Capitalized color names are from Robert Ridgway's "Color Standards and Color Nomenclature." Washington, D. C. 1912.

seven displayed well-developed bursae, approximately the same size as those found in the young males. The oviduct opening was not visible. Here again there was a difference in the colors of the unfeathered parts, though there was more variation, and the birds were not so readily separated into two groups. All of the bills were spotted and blotched with dusky and exhibited a gradual range from Deep Olive to Ochraceous-Orange. The feet varied from dusky Olive-Brown to Jasper Red. The four adults, however, were those with the reddest feet and most brightly colored bills.

It will be noted that the bill and foot colors of the adult and juvenile birds agree entirely with the respective characteristics attributed to the supposed races, *Anas r. rubripes* and *A. r. tristis*.

Further evidence tending to refute the existence of the two subspecies was obtained during the summer of 1942. Four adult Black Ducks were collected at Nettichi River on the west coast of James Bay between July 16 and 19. It should be recalled that this area is far to the north in the very heart of the range of the supposed red-legged race, *A. r. rubripes*. The coloration of the unfeathered parts of these birds was noted and sketched immediately after the birds were retrieved. Two were males, the first flightless and with body plumage well advanced in the post-nuptial moult. The second was entirely in eclipse body plumage but possessed new flight feathers and was capable of flight. The age of each bird was checked by the cloacal method, and the mature penis and complete absence of the bursa were noted in both. These birds showed a remarkable reversion to the bill and foot coloring of the juvenile male. Their bills were Grape Green in color, somewhat dusky along the ridge of the culmen. The feet in the flightless one were Cinnamon, in the full-winged one Pinkish Cinnamon.

The two females, both birds with broods of young, were in the post-nuptial moult, with wings and body feathers faded and worn and some new eclipse feathers showing on the sides and breast. The coloring of bill and foot in these birds bore a decided resemblance to the juvenile female. The bills were from Court Gray at the tip to Tea Green at the base, with a saddle of Dark Grayish Olive and a few blackish spots. In one specimen the feet were Cinnamon, in the other Tawny-Olive.

Pirnie has demonstrated that the bright coloration of bill and foot is not renewed until October or November, or in other words coincides with the acquisition of the new winter, or nuptial, plumage.

The facts as presented above appear to leave little doubt that *Anas rubripes tristis* and *A. r. rubripes* are one and the same.

In addition to the specimens mentioned above, I have critically examined seven birds in the streaked juvenile plumage. A juvenile male (July 15) which still possessed much down on the back and rump and was incapable of flight, had an Olive-Brown bill, pinkish at the base of the lower mandible. The feet were Benzo Brown. The bills of four

females of similar age were Dark Olive; the feet were as in the male.

A juvenile male, fully feathered and flying, which was taken on July 23, 1942, at Big Piskwanish, James Bay, had the bill varying from Mineral Gray at the tip to Gnaphalium Green at the base with an area of dusky along the ridge of the culmen. The feet were Pinkish Cinnamon. A juvenile female of the same age had the bill mostly Dark Olive, but Tea Green at the base with some dusky spots.

The downy young of both sexes have the upper mandible and base of the lower, Deep Olive-Gray. The nail and lower mandible are Pinkish Buff. The feet are Chamois to Cream-Buff, variously mottled with Buffy Olive and Olive-Brown.

The Black Ducks which may be seen in the hunter's bag in southern Ontario may be described as follows: In the early part of the season will appear streaked juveniles, with greenish bills and Tawny feet, and moulting adults still in partial eclipse plumage, with bills and feet closely resembling those of the juvenile. Later in the season (late November), the juvenile plumage will have given way to the first winter (or nuptial) plumage, which is practically indistinguishable from the adult winter plumage. In this stage the juvenile may retain the earlier coloring of the unfeathered parts but usually shows a change to a Greenish Yellow bill and Cinnamon feet. The adults at this season have regained the full winter plumage and also the yellow bills and red feet. By spring most of the yearlings have also attained the bright coloration of bill and feet and are indistinguishable from the adult. Some may be somewhat retarded in this respect, but the colors in all are much brighter than in November specimens.

In the course of this study it was thought advisable to check some of the characters which descriptions in the literature commonly ascribe to mature Black Ducks. One statement frequently encountered is that old males have the chin black. Two of the juveniles examined had the black chin, and one adult lacked it, indicating that this marking is not reliable as an age indicator, though it is probably more frequent in adult birds. Another age character is one suggested by Ticehurst (1938), namely that striae are present on the tip of the nail of the bill in young birds but absent in adults. These striae were certainly absent in all adults, but were also absent (or only faintly indicated) in most of the first winter birds, only three having them well-marked. A subsequent examination of skins in the Royal Ontario Museum of Zoology shows this character to be more constant in birds still in the juvenile plumage.

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ROYAL ONTARIO MUSEUM OF ZOOLOGY, TORONTO

THE SNOWY OWL MIGRATION OF 1941-42

A REPORT OF THE SNOWY OWL COMMITTEE,

PREPARED BY L. L. SNYDER

IN 1938 Charles Elton of the Bureau of Animal Populations, Oxford University, England, suggested that a committee which would gather data and briefly report pronounced migrations of the Snowy Owl (*Nyctea nyctea*) in North America would fill a useful role. The principal objective would be to record the fact of a migration, state its time-period, trace its direction, if possible, and picture its magnitude. Such information would serve as an index to certain conditions in the Canadian Arctic.

This proposal was discussed informally by several ornithologists on the occasion of the annual meeting of the American Ornithologists' Union held in Washington in October, 1938. These individuals, together with other volunteers living in areas likely to be involved by a flight, agreed to act as a committee for this work. A few were already concerned with accumulating data, annually, on populations of certain animals including the Snowy Owl. Others volunteered to obtain specific data whenever a pronounced flight became apparent.

No movement of Snowy Owls, south of the area which can be regarded as the normal wintering range, was evident until the autumn of 1941. At that time members of the Committee began gathering records. Each was concerned with a fairly definite region. Many hundreds of people contributed data through the several members, who here express their appreciation.

When the flight seemed to have spent itself and regional reports were complete, a large blank map was circulated among the members of the Committee. Specific locality records were plotted on this map. Two symbols were used. A small cross marked places where reports indicated that no unusual numbers of Snowy Owls had been observed. In this way it was possible to determine that a major incursion had not taken place during the autumn of 1941 in the central and northern prairie provinces of Canada. Numbers there could be considered usual. The second symbol used on the map was a small circle. This marked specific places where Snowy Owl occurrences had been unusual. If one or two birds had been observed, the circle was left open; if three to ten birds, the circle was half-filled with black; if more than ten, the entire circle was made black.

The provisional map was then used as the basis for a final map (Figure 1) prepared by T. M. Shortt. In order to reduce the map for publication the details of the provisional map were condensed. Three degrees of density are shown by correspondingly shaded areas, and sections where no pronounced flight or increase of winter population was reported are left blank.

Data contributed by Committee members from the several regions concerned the date when first records were made and the period when the flight was clearly obvious. (The Committee has not attempted an exhaustive study of migrating Snowy Owls.) These data are combined as a brief general statement of the 1941-42 flight in the following paragraphs. If the undertaking continues, future reports will not require so lengthy an introductory statement as seemed advisable here.

The Committee will gladly add to its numbers ornithologists who will, in future, undertake to gather information in areas not well covered in our initial attempt. Such areas will probably be shown by our map. The members of the Snowy Owl Committee are listed below:

B. W. Cartwright, Winnipeg, Manitoba
A. O. Gross, Brunswick, Maine
H. F. Lewis, Ottawa, Ontario
F. C. Lincoln, Washington, D. C.
O. S. Pettingill, Jr., Northfield, Minnesota
L. L. Snyder, (Chairman), Toronto, Ontario
J. D. Soper, Winnipeg, Manitoba
D. Stoner, Albany, New York
R. W. Tufts, Wolfville, Nova Scotia
J. Van Tyne, Ann Arbor, Michigan
V. C. Wynne-Edwards, Montreal, Quebec

The 1941-42 Migration

The migration of 1941-42 resulted in concentrations of Snowy Owls in the St. Lawrence valley, along the New England coast, and about the shores of the Great Lakes. The source of this flight was probably Baffin Island, Southampton Island, and the region about the Straits and Hudson Bay portion of Ungava. This view is in harmony with the 1939-40 Snowy Owl population map of Chitty and Chitty (*Jour. Animal Ecol.*, 10: 187) where it is shown that this species increased in these areas. The same map shows that the Snowy Owl had decreased in the western Arctic.

The earliest records were:—one seen on Grand Manan Island, New Brunswick, September 6; one seen at Hawkesbury, Prescott County, in the extreme eastern part of southern Ontario, on September 10. Late September records came from Maine, New York (Long Island), and Minnesota.

The period in which it became obvious that a pronounced flight of Snowy Owls was taking place may be stated for each of the several regions as follows: Province of Quebec, western section, early to mid-October, eastern sections, later; Maritime Provinces, early October; New England states, mid-October; southern Ontario, late October; New York state, mid-November; Michigan, late November; Minnesota,

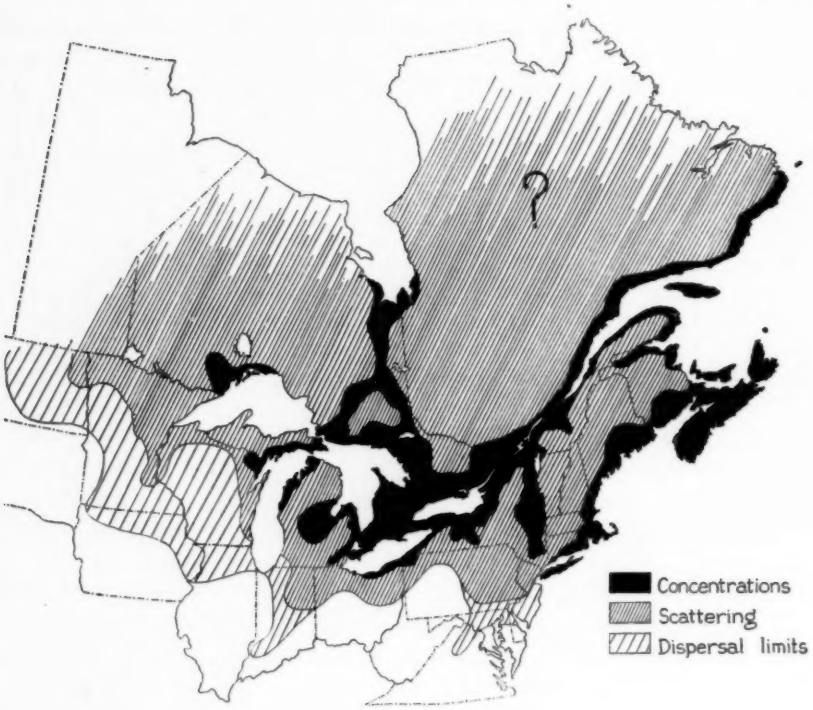

Figure 1. Snowy Owl flight. Scattered occurrences in the Ungava interior have been assumed. We are much indebted to T. M. Shortt for preparing the map.

late October. Maximum numbers were present in these sections two to three weeks later than the periods mentioned.

The line of flight taken by these migrants is suggested by the probable source, by the general topography, and by the time element as stated above. It would seem that the flight, which flowed southward and westward, may have followed, in its initial course, the Labrador coast, the east shore of Hudson and James Bay, and possibly, a smaller trickle, down the west coast of Hudson Bay (see Minnesota timing in relation to the east).

The above, together with the accompanying map, would seem to record the essential features of the 1941-42 flight. Other details can be left for treatment by individual ornithologists.

Royal Ontario Museum of Zoology, Toronto

NESTING HABITS OF THE BLACK-BILLED CUCKOO[1]

BY O. RUTH SPENCER

DURING the summers of 1939 and 1941, I carried on studies on the nesting habits of the Black-billed Cuckoo (*Coccyzus erythropthalmus*) at the University of Michigan Biological Station in Cheboygan County, Michigan. I kept six nests under daily observation, two from the laying of the first egg, and four from the last few days of incubation, through the nestling stage. I supplemented information obtained from these nests with data from five additional nests of the Black-bill and from two nests of the Yellow-billed Cuckoo (*Coccyzus americanus*), which has similar habits (Barrows, 1912: 338; Bent, 1940: 54).

To note details of nestling activities and kinds of food brought into the nesting area by the adults, observations totalling 94 hours were made from canvas blinds three to five feet from the nests; depending upon the nest height, these blinds were placed on the ground or on a tower. A 4x field glass was used. Additional observations, particularly on general habits, were made without a blind.

The information presented in this paper is based, except when otherwise indicated, upon data obtained from the six nests under observation. Table 1 is a summation of these data.

Grateful acknowledgments are made to Dr. Olin Sewall Pettingill, Jr., for guidance given in this study; to Dr. Theodora Nelson and Mrs. Margaret Nice for valuable help and critical reading of the manuscript; and to Dr. H. B. Hungerford for checking my identifications of insects.

Nests and Nest Building

The Black-billed Cuckoo generally nests in low trees or bushes (Chapman, 1937: 331), but nest-sites in the Biological Station area varied. The vegetation chosen for nests ranged from clumps of beech saplings (*Fagus grandifolia*) to coniferous trees (*P. strobus* and *Tsuga canadensis*) and tall deciduous trees (*Acer saccharum* and *Populus sp.*), and sites varied in elevation from 19 inches to 20 feet, with an average elevation of 5.9 feet.

The nests were always well concealed by overhanging branches and leaf-clusters. Made of small twigs loosely interwoven, and lined with leaf scraps, pine needles, catkin remains, or empty cocoons, they were comparatively frail platforms, with uniform ¾-inch inside depth and 3- to 3½-inch inside diameter. Apparently the material was gathered largely in the vicinity of the nest, both bulk and lining materials being chosen from those readily available. Two nests, No. 3 and No. 5, were selected for detailed examination of nesting material. The bulk of nest No. 3 gave a total of 65 twigs, 10 varying from 9 to 14 inches in length,

[1]Contribution from the University of Michigan Biological Station.

TABLE 1

SIX NESTS OF THE BLACK-BILLED CUCKOO

	Nest 1	Nest 2	Nest 3	Nest 4	Nest 5	Nest 6
Date found:	July 5, 1939	July 22, 1939	July 2, 1941	July 7, 1941	July 16, 1941	July 18, 1941
Habitat:	Wooded area	Open 2nd-growth aspen area	Open wooded area	Hilltop with aspen, beech, and bracken cover	Edge of low woodland thicket	Roadside bordered by aspen, maple, and occasional pines
Nest site:	Lower branch of white pine, 3 ft. from trunk	Angle of lower branch of small aspen	Small beech tree where two main branches crossed	Three-way fork of a sapling in a beech clump	Near top of hemlock, 1½ in. from trunk	Near tip of main branch of sugar-maple, 4–5 in. from trunk
Elevation of nest:	19. in.	19.5 in.	5.5 ft.	2 ft.	5 ft.	20 ft
Bulk of nest:	Twigs of wild cherry and maple and bracken leaf-stems	Twigs of maple, wild cherry, and aspen	Twigs of beech, bracken stem, and leaf-stalks	Twigs of beech and aspen	Twigs of arbor vitae, aspen, & osier, with dead maple- and aspen- leaves between	Aspen and maple twigs
Lining of nest:	Pine-needles and scraps of dead aspen leaves	Bracken leaf-scraps, moth cocoons, and lichen fragments	Scraps of dead beech & bracken leaves, pine-needles	Bracken leaves, leaf-stalks and aspen-leaf scraps	Small pieces of arbor vitae, scraps of maple leaves, pistillate willow-catkins, and pine-needles	Bracken, aspen-leaf scraps, pine-needles
Inside diameter:	3.25 in.	3.5 in.	3.75 in.	3.5 in.	3 in.	3.5 in.
Outside diam.:	5.5 in.	6.0 in.	6.5 in.	6.5 in.	7 in.	6.5 in.
Inside depth:	0.75 in.	0.75 in.	0.75 in.	0.75 in.	0.75 in.	0.75 in.
Outside depth:	1.5 in.	4.0 in.	3.0 in.	2.75 in.	3 in.	3 in.
Contents when found:	4 eggs	3 eggs	1 egg	1 egg	2 eggs	3 eggs

30 from 6 to 9 inches, and 25 from 3 to 6 inches. Nest No. 5 gave a total of 76 twigs of more uniform length, 40 varying from 5 to 12 inches, and 36 from 3 to 5 inches. The lining of the first nest was a small handful of dry leaf scraps, and of the second, a considerable mat of dead leaves, pieces of arbor vitae, willow catkins, and pine-needles.

I was not able to make observations during the nest-building period, but there is evidence that nest-building is prolonged into the incubation period. Three times at nest No. 6, an adult brought pine needles as lining material when coming to replace its mate on the nest. Twice the material was carefully worked into the nest.

Courtship Feeding

During my observations at nest No. 1 on July 12, 1939, the eighth day of incubation, one of the adults (presumably the female) was on a branch above the nest when the other (presumably the male) came into the nest area with a green larva in his bill. Within a few minutes he swallowed the larva and several times gave a loud call. Immediately the female began flirting her wide-spread tail, while making a low mewing sound. This display went on intermittently for fifteen minutes before she flew to the top branch of a nearby aspen. The male remained silent and motionless.

Again, two days later, one of the adults (presumably the male) came into the nest area with a larva in his bill and took the usual guarding position above the nest on a branch of a near-by tree. The female left the nest and alighted on a branch just below. In a few minutes the male hopped down to the same branch, ran down it toward the female and mounted her. However, copulation did not take place. The male immediately flew away with the larva still in his bill, and the female remained motionless. After eight minutes the male returned with another larva and alighted on the same branch with the female, but this time as he ran toward her she flew away. In a short while the male ate the larva he had brought, then remained on the branch ten minutes before moving out of sight. This behavior, though merely inceptive, can presumably be taken as illustrating courtship feeding (Lack, 1940).

Egg Laying, Incubation, and Hatching

The Black-billed Cuckoos laid from 2 to 4 eggs, with an average of 3 eggs per nest. The eggs were oval in shape and dull greenish blue in color, and some had a marbled appearance after three or four days' incubation.

The egg-laying interval was variable. The nests were checked daily at approximately 9 A.M. Each new egg was marked and recorded. Nest No. 3, when discovered July 2, contained one egg. A second egg was

laid July 3 and a third July 6. Nest No. 4 contained one egg when found July 7. A second was laid July 8 and a third July 10.

Several authors (e.g. Barrows, 1912: 340; Bent, 1940: 56, 73; and Herrick, 1910: 229–232) state that not infrequently Black-billed and Yellow-billed Cuckoos lay their eggs in each other's nests as well as in the nests of other birds. During my observations I noted only one case of parasitism, finding a Black-bill's egg in a Yellow-bill's nest with two young and two eggs of the Yellow-bill. It was readily distinguished from the other eggs by its deeper color and smaller size.

Incubation began after the laying of the first egg, but was three to four days shorter than the 14-day period given by Burns (1915: 283). In nest No. 3 one egg, laid and marked the morning of July 6, hatched the morning of July 16. In nest No. 4, the egg laid July 8 hatched July 19. The shortest period of sitting was 15 minutes, the longest 115 minutes, with an average period of 90 minutes. The shortest interval the eggs were left uncovered was 5 minutes, the longest 56 minutes, with an average interval of 28 minutes. The eggs were incubated 68 per cent of the time (calculated on the basis of 15 hours' observation, exclusive of the 4-hour period of unusual activity described later).

The sexes were not distinguishable, but I was able to corroborate the statement by Herrick (1910: 195) that both sexes take part in incubating the eggs. Several times a second adult came into the nest area, gave a low call, and took the place of the incubating bird as soon as the latter left the nest. In 17 hours of observation during the incubation period, I observed the second adult take over this duty three times.

During both incubation and brooding, the adult sat very quietly, turning the head from time to time, and moving the eyes more or less continuously. Contrary to the observation made by Herrick (1910: 197), the adults varied their position on the nest, but four birds seemed to have a favorite position, which they assumed more often than others. The birds had also a favorite path to the nest, but it was not invariably used.

Ordinarily the cuckoo remained close on its nest and was not readily flushed during the last few days of incubation. A striking exception to this was noted during an observation period the day before the first egg was hatched. Nest No. 6, containing 3 eggs, was about ten yards from the main road into the Station area. Three times the bird was frightened from the nest—by a low-flying airplane overhead, by a passing group of children, and by a passing truck. With each disturbance the bird flew to a favorite high branch above the nest, which it used as lookout, and then returned to the nest by flying down to the nest branch, and running along it, stopping cautiously and deliberately on the smaller branches on the way. The adult appeared continuously uneasy throughout the four hours of the morning-observation.

As far as I observed, egg-laying and hatching took place during the early morning hours, except in one case, when the younger nestling in nest No. 5 appeared about 3 P.M., July 18. This very exceptional case of afternoon hatching gave me the opportunity to watch hatching procedure. The adult left the nest upon my approach at 2:55 P.M., exposing one nestling and the second egg, whose shell was cracked and slightly parted around its lesser circumference, showing the young bird moving about inside. Within the next five minutes, half of the shell fell away. The young nestling began emitting low cries, and emerged from the remaining half-shell *entirely dry*. The adult, meanwhile, remained on a branch of an adjacent tree and called softly at irregular intervals.

The egg shells were usually disregarded by most of the adults, though they were sometimes pushed about in the nest with the bill. That they were not consistently removed was proved by the fact that many shell scraps were found in the bottom of the nests. However, at nest No. 6, an adult ate the larger pieces of shell. About four hours after the young hatched and after they were fed, the adult stepped over the nest, but before taking the brooding position reached into the nest and devoured what appeared to be small shell scraps. After a short period of brooding, the adult again reached into the nest and brought out the entire smaller half of the shell. It was too large to be taken into the mouth whole, so that it was necessary to crack the shell first between the mandibles. In about two minutes' time the bird had swallowed the entire half.

Nestling Stage

The newly hatched Black-billed Cuckoo nestling has a coal-black skin, whose feather tracts are made conspicuous by wiry gray "hairs" —the feather tubes of a vestigial down that never unfolds (Herrick, 1910: 198). The feet and bill are a steel-blue, the commissure very slightly lighter in color. By the third day the down-feather tubes are pushed out on the tips of the juvenal contour-feather tubes, and remain attached to these for four or five days. The feather tubes on the anterior portion of the ventral tract at first develop more slowly than the others, being barely visible until the fourth day, but in their later development they practically parallel those on the dorsal area. By the sixth day the juvenal contour-feather tubes, ranging in length from 17 mm. to 21 mm., give the young nestling the appearance of a porcupine, but on the seventh day the ends of these tubes begin to burst, and the nestling for the first time has a somewhat fluffy plumage. According to Herrick (1910: 206) the opening of the feather tubes (except those on the head and neck, which require longer) is completed in about 12 hours.

The day-old nestlings weighed from 7.5 grams to 9 grams, giving an average for 7 nestlings of 8.5 grams. Weight increased quite uniformly during the first four days, the average daily gain of 9 nestlings

being 4.7 grams; but the increase was more gradual during the remainder of nestling life, the average daily gain of 9 nestlings being 2.8 grams. The average weight of the 9 nestlings on the last day of nest life was 28.5 grams.

Feeding, Call Notes, Brooding of Young

Feeding began 1½ to 2 hours after hatching. The food consisted almost entirely of insects, 90 per cent of which were in the larval form. The remaining 10 per cent was made up of grasshoppers, small moths, mayflies, and robber flies, with an occasional spider. The larvae of the rosy maple moth (*Anisota rubicunda*) were extremely abundant in the Station area. This abundance probably explains why 81 per cent of the larvae fed to the young cuckoos were of this variety. Herrick (1910: 212) found that smooth larvae made up 44 per cent of the total food of Black-billed Cuckoos, hairy caterpillars 5 per cent, adult lepidoptera 5 per cent, and grasshoppers 27 per cent.

Feeding was done by both sexes. The adult approached the nest by running along the nest branch, and the resulting vibrations excited the food-response in the young: open mouth, stretched neck and flapping wings, accompanied by a sound like the buzzing of bees. As mentioned by Herrick (1910: 214), whenever this food-response was not given by the time the adult stepped on the nest edge, the parent immediately gave a peculiar low mewing sound, and this invariably excited a vigorous response.

"The wide-open mouth of the begging young bird displayed a very conspicuous group of snow-white disks of variable size symmetrically arranged on the bright red palate. (Herrick, 1910: 201). Some observers (e.g. Herrick, 1935: 99; Roberts, 1932: 593) believe these disks to be sucking pads used by the young to hold the adult's bill while feeding. However, in 75 feedings, I noticed close contact between the maxilla of the nestling and the bill of the parent only three times. Since the lower or inner edges of the larger disks were decidedly rough, the disks may be an aid in grasping the live food. Another possible function of these disks may be as a food target, since they greatly increase the conspicuousness of the palate.

The food was always carried to the young crosswise in the bill. Occasionally the adult crushed the food before bringing it into the nest area, but more often not until after alighting on the nest edge. Usually the food was thrust far down in the throat. When necessary, additional thrusts were given to hasten the swallowing response. With the younger nestlings the larva was put into the open mouth, then a motionless postion was held by both adult and young for many seconds—often for as long as two or three minutes—before swallowing occurred. Herrick (1910: 218) records an instance in which five minutes were required to awaken the swallowing reflex. If the first attempt failed, the larva

was withdrawn, further crushed, and put again into the throat. Occasionally this procedure had to be gone through a third time. With the older nestlings swallowing took place either immediately, or within a few seconds after the food was inserted into their mouths.

Food was generally brought by the adult when coming to take its turn on the nest, the other adult leaving the nest and not returning for a considerable period. A notable exception occurred about 10:30 A.M., July 24, 1941, at nest No. 6, which contained two nestlings. The brooding adult left the nest as the relief adult came up the nest-limb with a grasshopper nymph in its bill, which it fed to the day-old nestling and then ran down the nest limb out of sight. In less than three minutes it was back again with a larva about one inch long and correspondingly thick, which it fed to the same nestling. Just as the larva was inserted into the open mouth, the mate returned and alighted on the nest edge, carrying a well-developed larva of the rosy maple moth. The first adult withdrew the unswallowed larva just fed the nestling, and both parents gave the low food-call. Response was instantaneous, and both adults now tried to feed the younger bird. The first adult succeeded in replacing the same larva, and the mate turned about and placed the larva it was carrying in the wide-open mouth of the older nestling. The swallowing response of both nestlings was retarded because of the size of the larvae, the older one swallowing first. The second adult took the fecal sac and flew away again, leaving the other to assume brooding duties.

Feeding intervals varied considerably. At nest No. 1, containing three young (3-, 5-, 6-day age) intervals ranged from 1.5 minutes to 80 minutes; the average was 18.5 minutes during a 4-hour observation made in the morning. At nest No. 6, with two young (2-day, 3-day age), the feeding intervals varied from 3 minutes to 65 minutes over a five-hour morning-period, and averaged 25 minutes. Herrick (1910: 222) cites two extreme observations. For a 53-hour period at two nests containing six young (ages varying from one to six days), the feeding rate was once every 25 minutes. For an entire day at a nest containing three young (4-, 5-, 6-day), the feeding rate was once every 4 minutes. Herrick explained this high rate by lack of fear, abundant food, favorable weather, and no other young, already fledged, to divert the attentions of the parents.

After feedings on the first five days, fecal sacs were voided and were picked up by the adult. They were either swallowed immediately or carried away. During a four-hour period at nest No. 1 (containing 3 young), when 27 feedings took place, the fecal sacs were carried away after 17 feedings and swallowed after the other 10. On seven occasions after swallowing the sac, the adult settled on the nest, and on the three other occasions it again fed the nestlings several times. It thus appears that at this stage of nest life the manner of fecal disposal is determined

by the adult's next activity: if the bird is disposed to brood or feed again, it swallows the sacs; if not, it carries them away. Herrick (1910: 220) stated that the disposition of the fecal sacs was dependent upon various circumstances in which must be included the hunger of the old bird at the moment.

From the age of 5 days the nestlings backed to the edge of the nest before voiding the fecal sacs. Occasionally the sacs fell to the ground, but more often they fell on the edge of the nest and were picked up by the adult and either swallowed or carried away.

An unusually strong grasping-reflex appeared during the first five hours out of the shell, allowing the bird to cling to the nest. At one-day-old a very rapid opening and closing of the toes was noticed. On succeeding days the toes were opened and closed with greater force.

I noted a very slight shivering of the wings during the food response in all 14 nestlings at one-day-old. This movement became more forceful in the 2-day young. Four 3-day nestlings (nests Nos. 1, 2, and 4) were seen to stretch one wing after the other, sidewise, during prolonged absences of the adult. Grasping at this age was so well-developed that, unless I took great care when removing the young for weighing, the nest was pulled apart. Ten nestlings at 4 days (nests Nos. 1, 2, 3, and 4) stretched the wing on each side downward while extending the corresponding leg. This was done regularly during an adult's absence of an hour and fifteen minutes at nest No. 2, the leg-wing stretching occurring on the average every 8 or 10 minutes, with a maximum interval of 16 minutes.

I saw no evidence of the preening instinct which Herrick (1910: 205) says becomes very active on the sixth day. During the last two days of nestling life (6 and 7 days), with a very few quill tips on dorsal and ventral tracts opened, the young cuckoos were quick to pick at ants or flies on themselves. At no time could this action be mistaken for the combing action as described by Herrick (1910: 205).

During the first two days of nestling life the sound accompanying the feeding response had been similar to the buzzing of a bee. This buzzing gradually gave way to a "bark," a low grating call that took on true cuckoo characteristics about the sixth or seventh day. At the five-day age fear manifested itself in loud, explosive calls, and the young became especially reluctant to be taken from the nest for weighing. Either just before or at the time of removal they voided a brown, sticky excretion, whereas after feeding they invariably voided white fecal sacs.

Accompanying the changes in the grasping-reflex and wing-movements, and in the call of the nestlings, was the development of sight and hearing. The eyes began to open at two days and were wide open for short periods by the third day. At four days the nestling followed moving objects with its eyes, and at five days turned its head from side to

side in an attempt to see moving objects in the nest area. At one day of age the rustling of leaves excited the food response, which indicated an already keen sense of hearing. At five days the breaking of a twig several feet from the nest caused the nestling to turn its head in that direction. Both sight and hearing were well-developed by the six-day age.

At my approach to the nest during brooding the behavior of the adult very closely paralleled that described by Herrick (1910: 197). At first, the adult moved its head to keep me within view, but as I came nearer the nest (within 4 or 5 feet), the head began to rise and continued until the bill pointed to the zenith. Rapid movements of the eyelids and fast breathing movements were very noticeable.

Even though the adult cuckoo was normally a shy, retiring bird it became quite courageous and bold in defending its young. Early in the period of incubation, when flushed from the nest by my approach to within five feet of the nest, the adult flew very quietly to a nearby branch and watched. Toward the end of the incubation period (8 to 9 days) the adult did not leave the nest so readily, but remained motionless until I was within two or three feet of the nest. When it did leave, it was with a mewing sound and perhaps open bill. At the time of hatching, the adult was more reluctant to leave and more vigorous in its calls; it stayed closer to the nest than before—within two or three feet—while uttering kuk-kuks of protest. It continued to behave in this manner for the first three or four days of nestling life. Later, whenever the young emitted the raspy bark commonly made by them when disturbed, the adult became strikingly bold, and a number of times flew directly at my face with wide-open mouth, spread tail, and drooping wings, sometimes clapping the bill loudly. Each attack was usually short, and it quickly decreased in intensity, the adult finally perching on a nearby branch and quietly looking on.

Observations on the attendance of the adult were made for 10-hour periods at 2-day and 5-day ages of nestlings. In each case the data were obtained during ten hours' observation, during which the weather was clear and the temperature mild (78° F and 81° F). The periods of attendance were longest during the middle of the day. The shortest periods were in late afternoon, when feeding activity increased. For the 2-day nestling the maximum attendance period was 120 minutes, the minimum 45 minutes, giving an average of 87.5 minutes. For the 5-day nestling the maximum attendance period was 105 minutes, the minimum 10 minutes, giving an average of 43.3 minutes.

Weather conditions had an evident bearing upon brooding. During the entire life of the nestlings in nest No. 4, the weather was windy and cool (65° F: five-day average); brooding was maintained quite steadily through the first five days. The average length of the brooding period (based on 19 hours of observation) was 80 minutes, and the young

were brooded 54 per cent of the time. In contrast with this, at nest No. 6, when the temperature was quite high (93° F: three day average) with just an occasional breeze, the young were brooded only 26 per cent of the time. The average brooding period (based on 11 hours of observation) was 20 minutes, and the parent would often shade the young from the sun for an equivalent period.

During the approach and duration of a storm, brooding at nest No. 1 was maintained for a two-hour period. The adult apparently sensed the storm's approach, for although the second bird called from a nearby branch, the brooding one did not leave. Three times during the hour preceding the storm the adult used its bill and body in an attempt to push the nestlings deeper into the nest. As the storm broke, the bird noticeably lowered its body, at the same time spreading the wings over the nest edge and lowering the tail. With each additional downpour the body was pulled more tightly to the nest, tail lowered further, and bill pointed higher. For 45 minutes following the storm the only change the brooding bird made in her position was to lower her head. Herrick (1910: 225) watched a nesting adult during a 1½-hour rain. He noted that it left as soon as the rain was about over. He also noted that the bird raised her body two or three times during the rain to examine the young, whereas the one I observed did not raise the body until shortly before leaving the nest even though it was evident that the nestlings were decidedly restless.

Nesting Success

During the summer of 1939, when I kept two nests under daily observation, both were brought to successful completion except for a single egg, which did not hatch; but during 1941 only one out of the four nests was entirely successful. In one nest (No. 3), two out of three eggs hatched, the second four days after the first. The younger nestling was found dead at two days of age, hanging on the outer edge of the nest, from which it had probably been crowded. In another nest (No. 4), one of the three eggs was pushed out of the nest and, although I returned it before many hours had passed, it was again missing the next morning with no evidence of it on the ground under the nest. The younger of the two nestlings (three days of age) was also gone the following morning. In a third nest (No. 6), where brooding was in progress during a period of high temperatures (93°–99°), a 15-minute exposure to direct sunlight for purposes of photography killed the two nestlings. (The adults stayed near the nest for several hours afterwards, but deserted before the next day.)

Of the 18 eggs laid in the two seasons, 14 (87.4 per cent) hatched. Ten of the young (71 per cent) left the nest, giving a total for surviving young of 55 per cent from the six nests.

Nest Leaving

Herrick (1910: 199) says the cuckoo nestling, in proportion to its size, is probably the strongest and most enterprising altricial young on the North American continent. This, in part, explains the shortness of its nest life. Of the ten nestlings known to leave the nest, two left at the age of six days, and eight at seven days.

My single observation of a young bird leaving the nest was made during the summer of 1939 and occurred after I weighed the birds the evening of the seventh day. When I was returning one young to the nest, I noted that the one previously weighed had climbed out on the supporting branch, where it stood erect with upward pointed bill, suggesting the pose characteristic of a bittern. I loosened its grasp with difficulty and put it back into the nest. It immediately ran out again to the end of the nest-branch but, in its haste to escape, lost its balance and, while hanging by its toes, gave loud calls that brought the parent, in a spectacular display of courage, from its watching perch on a nearby tree. The young lost its hold, fell, and, still giving its calls, ran with amazing speed through the bracken (*Pteris*) for several yards before being caught. It was returned to the nest but remained quiet only a short while before repeating the attempt to escape, performing several climbing-feats with skill and speed. Once again the nestling was returned to the nest, but when I left the nest area it was standing in a climbing position on the supporting bracken stem and nest edge. The adult cuckoo, perched just a couple of branches above, was giving a low coaxing call.

Summary

In northern Michigan the Black-billed Cuckoo was found to nest usually in woodlands but occasionally in more open areas. A total of six nests were observed during the summers of 1939 and 1941.

Nest elevation varied from 19 inches to 20 feet, the average being 5.9 feet.

Possible cases of courtship feeding were observed.

The egg-laying interval varied from one to three days. Both sexes took part in incubating the eggs, one adult apparently assuming the greater responsibility. The incubation period, determined in two cases by marking the eggs, was found to be 10 and 11 days respectively.

Insect larvae made up 90 per cent of the food brought to the nestlings; the remaining 10 per cent consisted of miscellaneous insects.

The Black-billed Cuckoo nestling is exceptionally precocious. The most outstanding reactions displayed upon hatching or shortly thereafter are its grasping-reflex, call-notes, and enthusiastic food-responses.

Observations showed the average attendance-period of the parents to decrease somewhat less than 50 per cent between the 2-day-old and

5-day-old stages of nestling life. During cool windy weather, length of attendance-periods increased.

The young left the nest at the age of 6 or 7 days, with the juvenal-feather tubes just beginning to open.

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General Zoology. By Tracy I. Storer. McGraw-Hill Book Co., N.Y. 1943: 6 x 9 in., xii + 798 pp., illus. $3.75.

Ornithologists who want to gain a better understanding of birds in relation to the rest of the animal world will do well to study this admirable new zoology text by the California ornithologist, Tracy Storer. His 37 page chapter on birds is a remarkably clear and concise summary of the whole field of ornithology. Other chapters especially helpful to students of birds are those on ecology, distribution, and organic evolution.

We believe that many ornithologists will return to their special bird problems with renewed enthusiasm and vision after a study of this volume.—J. Van Tyne.

OBSERVATIONS ON THE NESTING OF THE KILLDEER

BY WALTER P. NICKELL

IN the last five years I have recorded a total of 17 nests of the Killdeer (*Charadrius vociferus*) on the Cranbrook Estate in Bloomfield Hills, Michigan. Observations on nine of these nests were cut short by a series of mishaps. In two instances, boys on bicycles rode through the nests, crushing the eggs; football players walked on two nests; the eggs in one nest were very probably overheated by exposure to the sun, for they were located in a dry field, and were left exposed for extended periods during unusually hot weather. Small children took the eggs from one nest, and the remaining nests were also robbed, probably by stray dogs.

During the season of 1942, I was fortunate in discovering eight nests of (presumably) three pairs of these birds within sight of my home, where I was able to observe them two or more times daily. All nests referred to in the following discussion are those observed during the 1942 season.

Habitat

The nests of all three pairs were found in the athletic fields of Cranbrook School—low, filled in, almost perfectly level fields, kept closely mowed during the Killdeer's nesting season, and bounded on three sides by winding lagoons. Five of the eight nests were located on the white lines of crushed limestone marking the boundaries of the various athletic fields.

Nest

The nests were little more than cavities in the earth or in the crushed rock. No apparent attempt was made to line them (though the power-driven lawn mower threw cut grass over the nests, and this filtered down beneath the eggs after the nests were made). The three nests which were not placed in the crushed rock of marker lines, were located in areas of sparse grass in the clay soil. These nest cavities were an inch to an inch and a half deep at the center, and diameters ranged from five to seven inches.

Nests of Pair One

The first of these nests was discovered on April 6 at 9:00 A.M., when the first egg was still warm after deposition. The second egg was laid on April 8 between 11:00 A.M. and 1:00 P.M. Three observations were made between 1:00 P.M., April 8, and the late afternoon of April 9. The nest held only two eggs at the last observation. During the night of the ninth, a heavy snow covered the nest to a measured depth of six inches. On April 10, at 7:00 A.M., and again at noon, I attempted to find the nest, but not even a slight depression was visible in the surface of the snow. Neither of the Killdeer was in evidence in the vicinity. At 4:00 P.M. I found the nest with ease, for in the mean-

time the female had dug down to the eggs and had laid the third egg. Her tracks in the snow showed plainly that she had alighted about 75 yards away and walked directly to the nest site. My own tracks, made previously the same day, circled the nest a few feet away. The Killdeer's tracks indicated that after depositing her third egg, she had left the nest on the opposite side from that of her approach. Somewhat tubular markings at the edge of the excavation were plain evidence that the seven-inch opening to the nest was dug largely with her beak. The

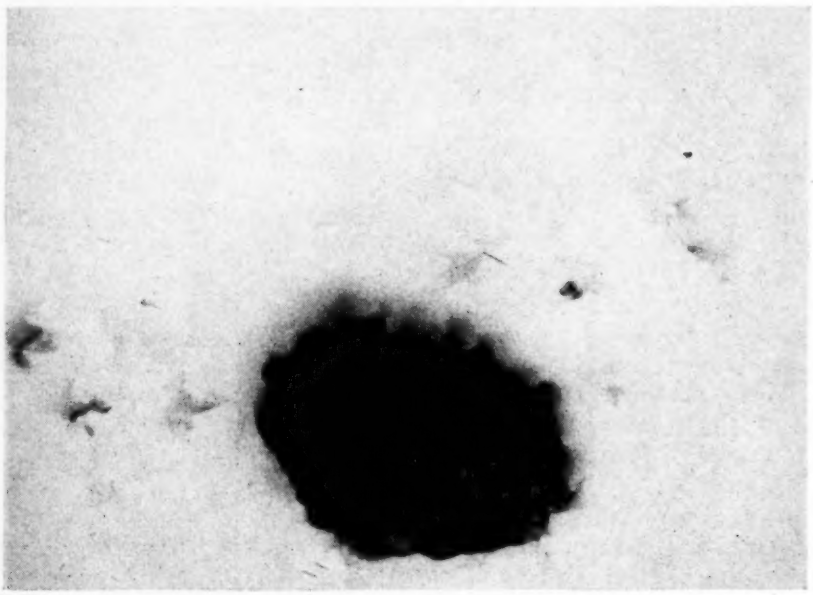

Figure 1. Killdeer nest on April 10 after being cleared of snow by the female.

fourth egg was laid less than 24 hours after the third, between 9:00 A.M. and noon on April 11. Consistent incubation began immediately or shortly afterward, for a bird was near the nest at noon on April 11, and the eggs were warm. At 2:00 P.M. on the same day, the incubating bird left the nest at my approach and ran off a few yards, uttering soft cries, but showed no other signs of distress such as the common "broken-wing" behavior. When I had made my observations and had moved away about a hundred yards, the bird came back quietly and settled upon the eggs, facing directly into a sudden flurry of snow. Observations were made three times daily until 7:30 P.M., April 17, when all eggs had disappeared. During these six days, incubation must have proceeded consistently, since at each observation the eggs were quite warm.

During the 12 days of observation of the first nest, I saw only one

bird at a time, but both were present near the nest site on April 18. At my approach both birds flew about, uttering loud distress cries. Suspecting that they were preparing to nest again soon, I kept the area under close observation. Although both birds were near the original nest site at each visit, I was not able to find the second nest until May 4, when its four eggs had been under incubation for several days. This nest was located on another yard-line, 17 yards from the first. Eight days later a power mower ran across the nest, badly

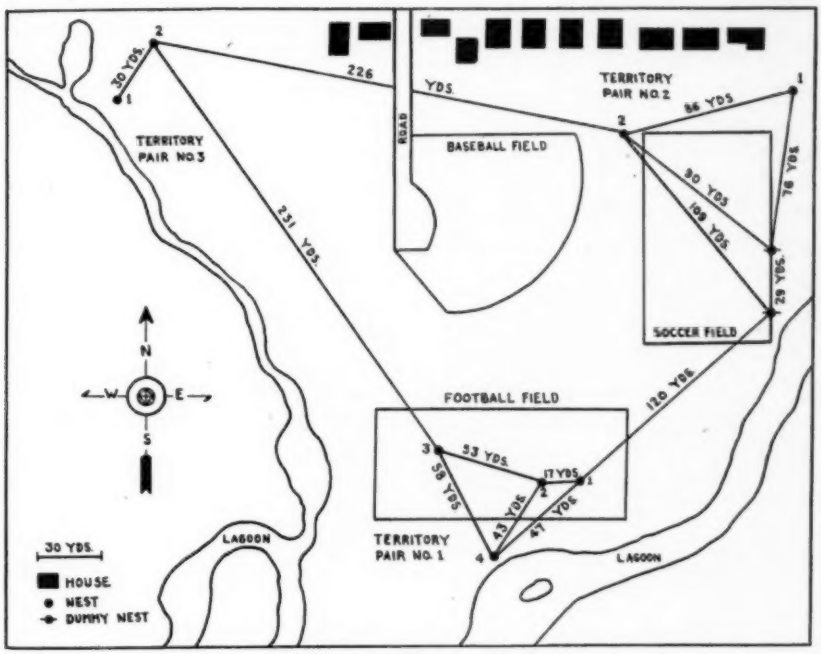

Figure 2. Killdeer nest sites.

cracking two of the eggs and breaking very small holes in the other two. All eggs were allowed to stay in the nest until May 16, when the two badly cracked ones disappeared, probably removed by the parent birds. At 8:00 A.M. on May 20, the young in one of the two remaining eggs could be heard, but had not broken through its shell. No activity inside the other egg was audible. At 6:30 P.M. on May 21, the first egg was pipped in one place. The young could be heard within the shell in the other egg. The first young emerged from its shell at noon on the following day but was quite weak. The second could still be heard. It finally pipped its shell between noon and 5:30 P.M., May 23, when it, as well as the first young, was found dead. The nest was then abandoned, although the adults were seen in the vicinity of the nest site at several subsequent observations.

The third nest, with four eggs, was discovered on June 3, just after the grass mower had crushed its contents. This nest was located on another yard-line, 53 yards from Nest 2. By this time, William Smith, the driver of the grass mower, was watching for a nest, and on June 11 he saw the pair showing great distress at a point near the edge of the football field, where he then found Nest 4. The new nest cavity was in a sparsely sodded spot 58 yards southeast of Nest 3.

The first egg was laid before noon on June 12, the second and third eggs were deposited before noon on June 13 and 14, and the fourth in the afternoon of June 14, some time before 7:00 P.M. Incubation began with the laying of the fourth egg. Daily observations were made through June 26, when I went north for the summer, leaving the final observations to Mr. and Mrs. Felix Bednarz of Birmingham, who were able to make early morning and early evening observations daily. They found three young out of the first laid eggs in the early morning of July 9. The fourth egg hatched during the early morning of July 10. No check was made on the period of parental care, for the parents and young left the immediate vicinity four days after the young hatched.

As will be noted on the accompanying map, the nearest part of the territory of Pair 2 was 120 yards distant, and since only one pair of Killdeer was seen in Territory 1 throughout the season, it is reasonable to assume that all four nests belonged to this pair. Moreover, the only other Killdeer known to be nesting within the boundaries of the Estate were Pairs 2 and 3, and they were occupied with their own family affairs at the time of Pair 1's nesting operations. Gayle Pickwell (1925) believed that one Killdeer he observed laid at least three clutches of eggs from early April to the last of June, and that she may have raised two broods.

Nests of Pair Two

The first nest of Pair 2 was discovered on May 5, 210 yards north of the first nest of Pair 1. This nest contained five eggs, which hatched in the following order: one young hatched and dry by 9:00 P.M., May 11, two hatched between 1:00 and 8:00 P.M., May 12, and the last two on the early morning of May 14. All of the young were banded, and they left the nest on the early morning of May 15. All were observed feeding with their parents daily, until June 12, when only two were seen. On June 4, I had found, and marked by stakes, three new nest cavities, made in the territory of this pair along the boundary lines of the soccer field. I watched these daily. There was no apparent difference in the cavities to indicate the one to be used. Two were located at distances of 76 and 105 yards south of the first nest of this pair. The other, the one chosen for the second clutch, was 86 yards to the west of the original site. The four eggs were laid as follows: before 8:30 A.M., June 17; before 8:30 A.M., June 19;

before 8:30 A.M., June 21; and in the afternoon of June 22. The two remaining young of this pair were still with their parents in the late afternoon after the fourth egg was laid, but were not seen after that time. These young were able to fly short distances, and I had to chase them down by bicycle in order to check their band numbers. Incubation of the second clutch began either near nightfall or early the next morning after the last egg was laid, for one of the adults was on the nest at 7:00 A.M., June 23, and the eggs were warm. Three eggs (the first laid) hatched before 7:00 A.M., July 16; the fourth egg early the next morning.

Pair Three

The third pair of Killdeer was found about 240 yards west of the territory of Pair 2 on May 4, with four young about a week old. These young were banded and observed with their parents until June 7, but were not seen after that time.

On June 17, a nest containing four eggs was found about 30 yards southwest of where the young had been caught and banded on May 4. On June 23 the bird incubating at that time was collected for one of the habitat groups in the Cranbrook Institute of Science. Dissection showed that it was the female. Within twenty minutes another bird, presumably the male, was on the nest, continuing the incubation. The young hatched during July 1, left the nest on July 2, and were under the care of the remaining parent through the last observation on July 13. There is little doubt that this was the second brood of Pair 3, since only one pair of Killdeer was seen at a time in this territory throughout the season.

The difference in behavior of the two incubating birds was notable. The female had been extremely wary and would leave the eggs before the observer came near the nest, running away and calling from a distance. When she was collected, the approach to the nest had to be made from behind thick shrubbery which reached to within 25 yards of the nest location. The "male" was much bolder and invariably remained on the nest until I had approached to within a few feet, when he began circling closely around my feet, spreading his tail and beating the earth with his wings. During this display he uttered loud, piercing, *dee! dee! dee!* calls, interspersed with trilling notes.

Discussion

Bent (1929:207) quotes several published reports on the Killdeer's incubation period. These range from 24 to 28 days. Miles D. Pirnie writes me that he found all four young hatched and away from a nest 23½ days after the last egg was laid. One of these young hatched 22½ days after the last egg was deposited. My own observations show incubation periods ranging from 24 to 26 days. It is possible that the first eggs to hatch in each clutch received some incubation at night

before regular incubation began, although I always found the eggs cold until the last one was laid. A factor which probably contributes to the delay in hatching of the later eggs is the tendency of some parent Killdeers to leave the nest with the first young hatched, allowing the remaining egg or eggs to become chilled. On several occasions, I have found dead young in well-pipped eggs which had been abandoned.

Bent (1929:207) states that both sexes incubate and both take care of the young, and my observations agree. Finally, other observers have reported the Killdeer building incomplete nests near the nest that was actually used.

Summary

At Bloomfield Hills, Michigan, eight nests of three pairs of Killdeer were studied in 1942.

In one nest, the clutch was complete by April 11, an early date for this region. This nest, when it contained only two eggs, was covered overnight with six inches of snow so that the observer was unable to find it, though the Killdeer found it without difficulty, cleared it of snow, and laid the third egg.

There were seven clutches of four eggs, one of five.

Periodicity of egg-laying was found to be variable, not only between females, but in the same individual.

In three nests, incubation began immediately or shortly after the last egg was laid.

The incubation period varied from 24 to 26 days.

When the incubating female was collected at one nest, another bird (presumably the mate) took over the task of incubation.

The period of parental care for two broods was 39 and (about) 42 days.

One female apparently laid four clutches of eggs during the season (April 6 to June 14). The second clutch produced young which died, and the fourth produced young that were perhaps raised successfully.

Two pairs were double brooded.

Three new nests (two unused) were made by one pair before the second nesting.

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A HAWK CENSUS ON TEXAS PANHANDLE HIGHWAYS

BY PHILIP F. ALLAN AND PALMER R. SIME

THE Texas Panhandle offers an almost unparalleled opportunity for the observation of hawks. The broad expanses unobscured by trees or hills, the predominance of clear days with excellent visibility, and the uniformity of landscape combine to make unusual or moving objects conspicuous and the observation of hawks easy.

The Panhandle is that part of Texas north of a line drawn diagonally from Childress County, at the southwest corner of Oklahoma, to Winkler County, at the southeast corner of New Mexico. Most of the Panhandle is made up of treeless short-grass plains of 3,000 to 4,000 feet elevation. It is dissected by intermittent or shallow permanent streams, with wooded banks. Approximately a third of the Panhandle consists of rolling, mid- or tall-grass plains, often covered with sagebrush and oak shinnery. Elevations here are about 1,500 to 2,000 feet. Between the easterly rolling plains and the westerly high plains is an abrupt break, rising sharply. This area is characterized by canyons and buttes, often sparsely covered by grasses, junipers, and deciduous shrubs. Abrupt cap-rock rims lie immediately below the high plains.

Stimulated in part by the sight of large flocks of Swainson's Hawks in migration, the authors, whose regular work required much automobile travel, decided to keep a record of hawks, kites, vultures, and eagles seen en route. The method of observation was essentially that used by Nice (1934) and others; that is, miles traveled and hawks seen were recorded. In contrast to other highway bird observations, these were confined to a comparatively small area, the Texas Panhandle.

The trips were made at random between October, 1938, and January, 1942. A total of 26,768 miles was driven. Most of our trips were separate, but occasionally we traveled together. Although both of us covered most of the Panhandle at one time or another, Allan's observations were made particularly in the northern portion, while Sime's were made in the southern part. A convenient data sheet was used, upon which was recorded the origin and destination of trips, date, speedometer readings, miles traveled, and number of hawks of each species seen. It was found impracticable for one man to record the exact location of each observation, the habitat type, and other information while traveling, so early efforts to obtain these data were abandoned.

After some trials in analyzing the data, we decided to group the records into quarters of the year. These seem to be more comparable than individual months. Beginning with November, 1938, the data were grouped to cover 13 consecutive quarters. The three months of fall migration—August, September, and October—were placed to-

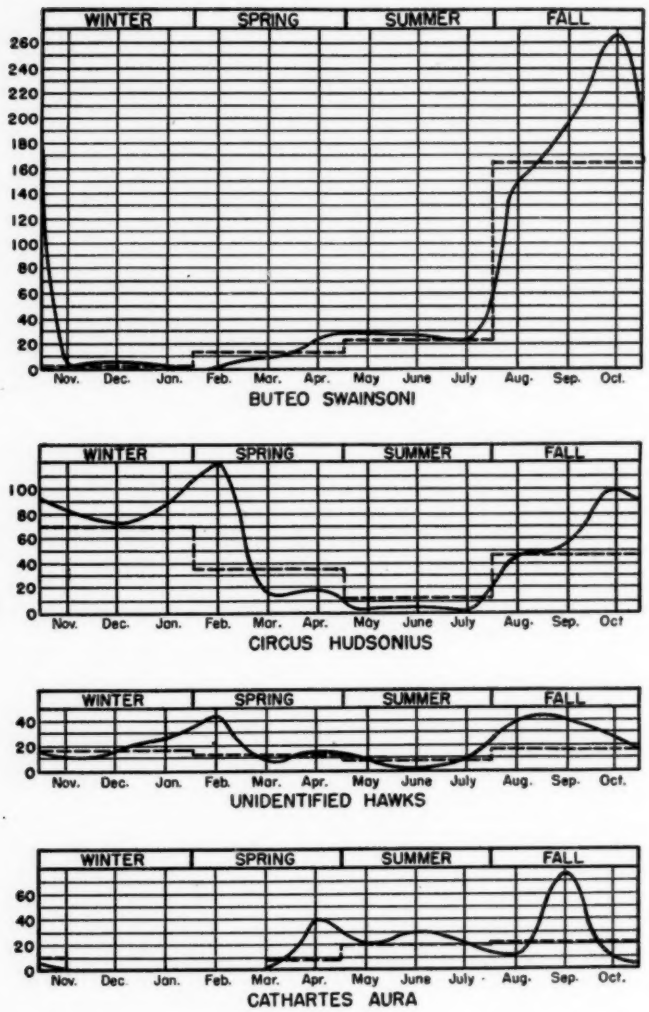

Figure 1. Population trend, based on the rate per thousand miles traveled. The solid line represents the monthly average; the broken line the seasonal average.

gether. Thus November, December, and January are "winter"; February, March, and April are "spring"; and May, June, and July are "summer." Although the data are somewhat meager for some months, we believe that annual population trends are fairly well indicated in Figures 1 and 2.

The individuals of each species were totaled by quarters, and the relative abundance of each was determined (Table 6). The number of miles of travel per hawk of each species was calculated, and converted to the number of each species seen per 1,000 miles of travel. The results of these calculations appear in Tables 2 to 5 inclusive. (In the tables, the data are arranged under "seasons" as defined above.)

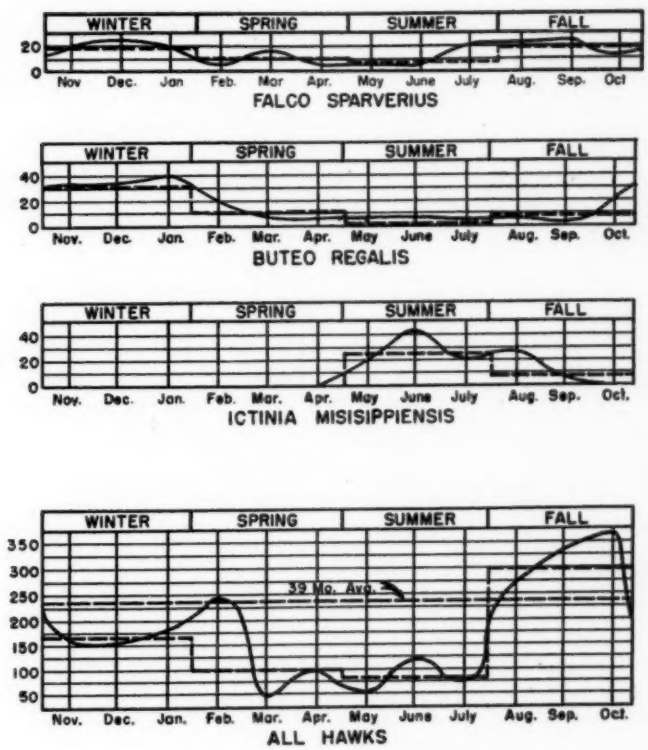

Figure 2. Population trend, based on the rate per thousand miles traveled. The solid line represents the monthly average; the broken line the seasonal average.

It is interesting to compare our data on hawks (Table 1) with those of Mrs. Nice. The figures on vultures for the Texas portion of her trip are remarkably close to ours of 1939 and 1941. There is, however, considerable difference in hawk figures. Our observations show that the summer months are relatively poor for obtaining records. It is difficult to see hawks unless they are in flight, and during the heat of the day they are likely to be resting in the shade.

TABLE 1

COMPARISON OF HAWK POPULATIONS RECORDED BY NICE (1933) AND ALLAN AND SIME (1939-1941)

June-July	Miles	Hawks		Vultures		Birds		Location	Authority
		No.	Miles Per	No.	Miles Per	No.	Miles Per		
1933	6,349	50	127.0	70	90.7	120	52.9	Ohio-Ariz.*	Nice
1933	557	7	79.6	16	34.8	23	24.2	Texas**	Nice
1939	1,470	115	12.8	41	35.9	156	9.4	Tex. Panhandle	Allan and Sime
1940	200	8	25.0	4	50.0	12	16.7	Tex. Panhandle	Allan and Sime
1941	566	31	18.3	16	35.3	47	12.0	Tex. Panhandle	Allan and Sime

*Round-trip part of travels.
**Texas part of travels.

While there was some concentration of hawks along highways, we were unable to detect how much the perching sites and carrion to be found there attracted them. Much of the travel was done on ranch roads, and there seemed to be as many hawks along them as there were along major highways.

Fifteen species were observed. It is probable that at least three more species occur at times in the Texas Panhandle. J. O. Stevenson (1942) records the Harris Hawk (*Parabuteo unicinctus harrisi*) from Palo Duro Canyon, and Florence M. Bailey (1928) attributes to Ligon a record 50 miles northeast of Carlsbad, New Mexico, which is 25 to 30 miles west of Gaines or Yoakum counties, Texas. The Black Vulture (*Coragyps atratus*) occurs not far south of the Panhandle. Pigeon Hawks (*Falco columbarius*) may occur as stragglers or uncommon migrants, but we have not positively recognized them. E. T. Seton (correspondence) informs us that a female of Richardson's Pigeon Hawk was taken by him on the Perico Ranch in Union County, New Mexico, which is 25 to 30 miles west of Dallam County, Texas.

Cathartes aura. Turkey Vulture (Figure 1).—Earliest spring record: April 1, 1941. Latest fall record: October 15, 1940. On April 19, 1939, 43 were seen in 80 miles, or 1 per 1.9 miles. (Hereafter, the ratio of miles traveled to birds seen is expressed numerically, thus: 1.9:1.) During April, 1940, 20 were seen in 237 miles (11.8:1). On September 25, 1939, 132 Turkey Vultures were seen in 183 miles (1.4:1). During the month of September, 1939, 189 Turkey Vultures were seen in 2,535 miles of travel (13.4:1). Our data show migration peaks in April and September (Figure 1). In the Texas Panhandle this bird was found principally in canyons and wooded river bottoms.

Ictinia misisippiensis. Mississippi Kite (Figure 2).—Earliest summer record: May 4, 1939. Latest fall record: September 25, 1939. The largest number for

one day was recorded on May 28, 1939: 23 seen in 79 miles (3.4:1). The high day in fall was August 30, 1939: 23 in 307 miles (13.3:1). High month was May, 1940: 29 seen in 585 miles (20.1:1). High fall month was August, 1939: 36 seen in 1,470 miles (40.9:1). The Mississippi Kite seemed to be principally confined to wooded bottomlands. It was common in the northeastern Panhandle and ranged at least as far west as Potter County. Bent (1937) indicates its occurrence at Tascosa (Oldham County), west of Potter County.

Accipiter velox. Sharp-shinned Hawk.—This bird was scarcer than the Cooper's Hawk. Only 8 were seen. Like the preceding species, it frequents the heavily wooded bottoms. Paul Russell found it in summer in Palo Duro Canyon, according to J. O. Stevenson.

Accipiter cooperi. Cooper's Hawk.—This was one of the rarer hawks, but it is rather shy and frequents the more heavily wooded valleys; hence it may have escaped our notice. It seems to be only a transient here.

Only 14 were seen. The habits of this and the preceding species are so different from those of the other species treated in this paper that our figures can give no real indication of relative numbers.

Buteo borealis. Red-tailed Hawk.—The Red-tail, primarily a winter bird in the Texas Panhandle, is relatively uncommon, but by no means rare. J. O. Stevenson informed us that Redtails have been observed in Palo Duro Canyon in summer by Russell. It is a bird of wooded rangeland, particularly of canyons and river bottoms. Earliest fall date: August 1, 1939. Latest in summer: May 9, 1941. Highs in single day observations were January 12, 1939: 4 seen in 57 miles (14.2:1); and October 23, 1939: 6 seen in 85 miles (14.2:1). High month was October, 1938: 5 seen in 150 miles (30.0:1). January, 1939, however, is probably a fairer sample: during this month 9 were seen in 673 miles (74.8:1).

Buteo swainsoni. Swainson's Hawk (Figure 1).—The huge flocks of migrating Swainson's Hawks have been described many times. To a certain extent this migration disrupted our data, for in September and October, 1939, we observed 1,961 of these hawks—a record we never again approached. In random travels it is possible to miss large concentrations of hawks, as we apparently did in 1940 and 1941, for large flocks were reported to us during those years. There is some reason to believe that 1939 was unusual, for it was a year of very dry weather and an abundance of grasshoppers.

When not migrating, flocks of Swainson's Hawks frequent the egg-laying beds of grasshoppers, sometimes in flocks of a thousand or more.

In migration, the flocks are a loose group of flapping, wheeling, and soaring birds, moving from ground level to the limits of visibility. Sometimes the horizontal movement is relatively slow, while at other times the flock moves rapidly. On one occasion following a raw, rainy day, 641 hawks were counted in about an hour's time. On this day, October 9, 1939, the weather was clear and cool, with a strong northwest wind.

The Swainson's Hawk is a common summer resident in the Panhandle, nesting nearly everywhere that there are a few cottonwood trees. Earliest record for arrival: March 28, 1941. Latest one seen: December 7, 1938. Our high one-day record for spring is April 19, 1939: 30 seen in 80 miles (2.7:1). The high spring month was May, 1939. In 1,131 miles of travel we saw 58 (19.5:1). Our high day for fall was October 9, 1939: 641 seen in 35 miles (.05:1). On August 30, 1939, we saw 214 in 307 miles (1.4:1); on September 17, 1939, our record was 155 hawks in 165 miles (1.1:1). On September 27, 1939, 397 passed over Amarillo, Texas, but these do not appear in our statistical data, since they were not observed in the course of our travels. On September 26, 114 were seen in a 70-mile trip (.6:1). September and October, 1939, were the high fall months. During September we recorded 1,224 Swainson's Hawks in 2,535 miles of travel (2.1:1); and during October we recorded 737 in 1,381 miles (1.9:1). In August, 1941, 573 miles were traveled and 62 hawks seen (9.2:1).

Swainson's Hawks were abundant in all types of habitats, but were predominant on rangeland. They often were perched on telegraph wires, a habit unusual in large birds. Among the foods are cottontails and jackrabbits killed by automobiles. A young Swainson's Hawk was seen on one occasion to make a very awkard and unsuccessful stoop at a Horned Lark (*Octocoris alpestris*).

Buteo lagopus. American Rough-legged Hawk.—This uncommon hawk is a winter resident only. Earliest winter record: November 2, 1938. Latest record in spring: April 21, 1939. This seems to be an unusually late date, and the bird may have been weak or injured. The April 1, 1941, date is more likely normal. American Rough-legs were so scarce that mileage records are hardly significant. The high month was February, 1940, when 7 were seen in 372 miles of travel (53.1:1). In December, 1938, we saw 14 in 1,144 miles of travel (81.7:1), and in February, 1939, we recorded 7 in 846 miles (120.8:1).

Because this species is slow and unafraid, many are killed by hunters, who find them easy targets along highways.

Buteo regalis. Ferruginous Rough-legged Hawk (Figure 2).—This is a year round resident of the Panhandle. Some of the nests are huge. The accumulations of nesting materials of many seasons evidently account for their size. One large nest in Moore County was located in a hackberry (*Celtis sp.*). This nest was about 4 feet in diameter and nearly 3 feet thick and supported the weight of a man. In 1939, three young Rough-legs were raised here, but in 1940 and 1941, the nest was occupied by Great Horned Owls (*Bubo virginianus*). Interestingly enough, an unoccupied nest was discovered in 1940 on the bare ground not far from the large nest.

High day for Ferruginous Rough-legs was December 7, 1938: 18 were seen in 112 miles (6.2:1). On November 11, 1938, 18 were seen in 125 miles (6.9:1). High month was December, 1938: 66 were seen in 1,144 miles of travel (17.3:1).

During the breeding season this hawk occurred only on rangeland, but later was seen almost everywhere. As with the American Rough-leg, many are killed along highways.

Aquila chrysaëtos. Golden Eagle.—Although a year round resident, the Golden Eagle was seen mainly during the winter months, and then only uncommonly. It nested in Palo Duro and Cito canyons in Randall County, and in 1941 was observed nesting in a large cottonwood in Hartley County. During the month of January, 1942, we saw 6 in 656 miles (109.3:1).

The Golden Eagle in the Texas Panhandle, as elsewhere in the west, is principally a bird of canyons and rangeland.

Haliaeetus leucocephalus. Bald Eagle.—Only one Bald Eagle was recorded, though it is reported as being not unusual in the Panhandle of Oklahoma.

Circus hudsonius. Marsh Hawk (Figure 1).—The Marsh Hawk is essentially a winter bird in the Texas Panhandle, although it appears early and stays late. During the wet summer of 1941 it nested in Randall County. A nest was found May 30, 1941. Marsh Hawks usually appeared early in August (August 1, 1939, 1941) and became scarce after April. Latest summer date: June 30, 1939. The high day for fall was September 9, 1939: 37 seen in 83 miles' travel (2.2:1). On February 1, 1940, 32 were seen in 116 miles (3.6:1), and on January 10, 1942, 37 were seen in 120 miles (3.2:1). Some of the high months were February, 1940: 74 seen in 372 miles (5.0:1); November, 1941: 88 in 527 miles (5.9:1); December, 1941: 133 seen in 948 miles (7.1:1); and January, 1942: 115 seen in 656 miles (5.7:1). The numbers of Marsh Hawks during several other months were fairly high. More Marsh Hawks were observed than any other species except the Swainson's Hawk. A total of 1,374 was seen in 26,768 miles' travel (19.5:1). Migration peaks apparently occurred in February and October (Figure 1).

While the Marsh Hawk is ubiquitous, it frequents croplands, especially cotton and sorghum fields, more than it does pasture. As would be expected, it was often seen near playas (wet-weather lakes). Marsh Hawks were particularly abundant in areas having large populations of cotton-rats (*Sigmodon hispidus*). The remains of this rodent were found in a fresh Marsh Hawk pellet, and nearby there were two dead cotton-rats. Jack rabbits and cottontails killed on the highway are a staple and abundant source of food. We witnessed an unsuccessful attack on a covey of Scaled Quail (*Callipepla squamata*), and we found Marsh Hawks eating Meadow Larks (*Sturnella neglecta*) and ducks, the latter presumably wounded.

Pandion haliaëtus. Osprey.—Ospreys were rare migrants through the Texas Panhandle. En route they obtain food in some of the larger lakes, where they were found fishing. Six Ospreys were seen, but only 4 of these figure in our data. One was seen on a power line pole on September 26, 1941, in Amarillo, Texas. Another was observed on June 18, 1942, at Buffalo Lake, Randall County.

Falco mexicanus. Prairie Falcon.—The Prairie Falcon was uncommon and was seen principally in the winter, although occasionally at other times. Summer observations lead us to believe that it may nest in some of the canyons. Although January, 1941, showed fewer miles per bird (93.0:1), so few miles were traveled during that month that it is best that October, 1939, be considered high. In this month, 15 were seen in 1,381 miles (92.1:1).

This falcon was seen about equally in rangeland and cropland. Like its larger relative, the Duck Hawk, it sometimes winters in cities. One frequented the larger buildings at Amarillo during the winters of 1938 and 1939. Also, like the Duck Hawk, this bird is sometimes seen at play. On one occasion a Prairie Falcon was observed making repeated stoops at a Ferruginous Rough-leg. The latter rolled over in air and presented a formidable defense, which caused the little falcon to swoop upward. On another occasion, a Prairie Falcon and a Marsh Hawk were observed in what appeared to be a game. The two maneuvered in such a manner as to be facing each other about 10 feet above the ground. They then rose vis-à-vis, keeping about three feet apart, to a height of about 50 feet, when they separated, dove earthward, and then repeated the trick. This continued for about three minutes.

Falco peregrinus. Duck Hawk.—The Duck Hawk was decidedly rare. Only three were seen on our travels, but two or three more have been seen when we were not traveling.

Falco sparverius. Sparrow Hawk (Figure 2).—This hawk ranked fourth in abundance and is a year round resident. It was most abundant in winter. Our high day was December 1, 1940: 10 seen in 36 miles (3.6:1). September 9, 1939, was also a high day: 10 seen in 83 miles (8.3:1). High fall month was December, 1941: 40 seen in 948 miles (23.7:1); and high spring month was April, 1939: 45 seen in 2,413 miles (53.6:1). August, 1941, (28.6:1), September, 1939 (34.7:1), and January, 1939 (32.0:1), were also high months. Migration data did not show well defined peaks.

This hawk generally frequents areas of tree growth and was commonly seen along railroad right of ways, sitting upon telegraph poles. One is likely to see Sparrow Hawks nearly anywhere in the Panhandle.

Unidentified hawks. It is to be expected that in a survey of this kind many hawks would be unidentified. Whenever it was convenient to do so, questionable identities were checked with a 7x35 binocular. Melanistic hawks, with the occasional exception of Swainson's Hawk and Ferruginous Rough-legs, were usually unidentifiable. Most of the unidentified birds were buteonine. We believe that all birds listed in the accompanying tables as unidentified hawks actually *were* hawks. We were careful to exclude Ravens and Mourning Doves.

TABLES 2 and 3

ABUNDANCE OF HAWKS BY SEASONS

Species	Winter 1938-1939		Spring 1939		Summer 1939		Fall 1939	
	No.	Rate*	No.	Rate*	No.	Rate*	No.	Rate*
Turkey Vulture	..	..	81	21.2	54	20.7	213	39.5
Mississippi Kite	..	..	..	..	70	26.9	47	8.7
Sharp-shinned Hawk	2	.7	..	..	2	.8	2	.4
Cooper's Hawk	8	2.8	2	.5	..	..	2	.4
Red-tailed Hawk	26	9.0	16	4.2	..	..	15	2.8
Swainson's Hawk	2	.7	120	31.3	106	40.8	2239	416.7
American Rough-legged Hawk	24	8.3	9	2.3	..	..	..	..
Ferruginous Rough-legged Hawk	136	47.2	44	11.5	12	4.6	25	4.6
Golden Eagle	6	2.1	6	1.6	2	.8	4	.7
Bald Eagle	..	..	1	.3	..	..	..	..
Marsh Hawk	178	61.7	85	22.2	8	3.1	354	65.8
Osprey	..	..	..	..	..	..	4	.7
Prairie Falcon	17	5.9	2	.5	2	.8	26	4.8
Duck Hawk	..	..	..	..	..	..	3	.5
Sparrow Hawk	58	20.1	71	18.5	14	5.4	118	21.9
Unidentified	74	25.6	70	18.2	14	5.4	176	32.7
Totals:	531	185.2	507	131.6	284	108.7	3228	588.2
Miles traveled during period:	2,887		3,834		2,601		5,384	

Species	Winter 1939-1940		Spring 1940		Summer 1940		Fall 1940	
	No.	Rate*	No.	Rate*	No.	Rate*	No.	Rate*
Turkey Vulture	..	..	20	15.0	22	28.0	2	3.3
Missisippi Kite	..	..	..	..	29	36.9	..	..
Sharp-shinned Hawk	..	..	..	..	..	..	1	1.7
Cooper's Hawk	..	..	1	.8	..	..	..	..
Red-tailed Hawk	13	7.5	3	2.4	..	..	4	6.7
Swainson's Hawk	2	1.1	3	2.4	7	8.9	4	6.7
American Rough-legged Hawk	5	2.9	7	5.6	..	..	..	..
Ferruginous Rough-legged Hawk	26	15.0	15	12.1	2	2.5	9	15.0
Golden Eagle	1	.6	3	2.4	..	..	..	..
Bald Eagle	..	..	..	..	..	..	..	..
Marsh Hawk	84	48.5	79	63.7	1	1.3	28	46.7
Osprey	..	..	..	..	..	..	..	..
Prairie Falcon	5	2.9	4	3.2	..	..	1	1.7
Duck Hawk	..	..	..	..	..	..	..	..
Sparrow Hawk	10	5.8	14	11.3	5	6.4	3	5.0
Unidentified	12	7.0	26	21.0	..	..	8	13.3
Totals:	144	90.1	147	146.3	66	84.0	60	100.1
Miles traveled during period:	1,730		1,239		785		600	

*Number per 1000 miles of travel.

TABLES 4 and 5

ABUNDANCE OF HAWKS BY SEASONS

Species	Winter 1940-1941		Spring 1941		Summer 1941		Fall 1941	
	No.	Rate*	No.	Rate*	No.	Rate*	No.	Rate*
Turkey Vulture	..	..	1	.8	27	16.7	18	21.2
Mississippi Kite	..	..	..	..	23	14.2	..	..
Sharp-shinned Hawk	..	..	..	..	..	..	..	..
Cooper's Hawk	..	..	..	..	..	..	..	..
Red-tailed Hawk	2	1.1	..	..	2	1.2	1	1.2
Swainson's Hawk	1	.5	6	4.6	21	13.0	66	77.5
American Rough-legged Hawk	2	1.1	2	1.5	..	..	..	..
Ferruginous Rough-legged Hawk	71	39.2	9	6.1	3	1.8	7	8.2
Golden Eagle	1	.5	..	..	..	..	..	..
Bald Eagle	..	..	..	..	..	..	..	..
Marsh Hawk	95	52.4	19	14.7	11	6.8	50	58.5
Osprey	..	..	..	..	..	..	..	..
Prairie Falcon	6	3.3	1	.8	1	.6	1	1.2
Duck Hawk	..	..	..	..	..	..	..	..
Sparrow Hawk	33	18.2	4	3.1	4	2.5	29	34.1
Unidentified	16	8.8	13	10.0	15	10.2	7	8.2
Totals:	227	125.0	55	42.5	107	66.2	179	212.8
Miles traveled during period:	1,812		1,295		1,617		850	

Species	Winter 1941–1942		Total Period 1938–1942	
	Number	Rate*	Number	Rate*
Turkey Vulture	..	..	438	16.4
Mississippi Kite	..	..	169	6.3
Sharp-shinned Hawk	1	.5	8	.3
Cooper's Hawk	2	.9	15	.6
Red-tailed Hawk	15	7.0	97	3.6
Swainson's Hawk	1	.5	2578	96.2
American Rough-legged Hawk	4	1.9	53	2.0
Ferruginous Rough-legged Hawk	56	26.2	415	15.5
Golden Eagle	9	4.2	32	1.2
Bald Eagle	..	..	1	tr.
Marsh Hawk	336	158.7	1374	51.3
Osprey	..	..	4	.2
Prairie Falcon	10	4.7	76	2.8
Duck Hawk	..	..	3	.1
Sparrow Hawk	70	32.9	433	16.2
Unidentified	48	22.5	479	17.9
Totals:	555	263.2	6175	232.5
Miles traveled during period	2,131		26,768	

*Number per 1000 miles of travel.

TABLE 6

RELATIVE SEASONAL ABUNDANCE OF HAWKS BY PERCENTAGE

	Turkey Vulture	Mississippi Kite	Sharp-shinned Hawk	Cooper's Hawk	Red-tailed Hawk	Swainson's Hawk	American Rough-legged Hawk	Ferruginous Rough-legged Hawk	Golden Eagle	Bald Eagle	Marsh Hawk	Osprey	Prairie Falcon	Duck Hawk	Sparrow Hawk	Unidentified
Winter '38-'39	..	..	.4	1.5	4.9	.4	4.5	25.6	1.1	..	33.3	..	3.2	..	10.9	13.9
Spring 1939	16.0	..	..	.4	3.2	23.7	1.8	8.7	1.2	.2	16.8	..	.4	..	14.0	13.8
Summer 1939	19.0	24.6	.7	..	..	37.3	..	4.2	.7	..	2.8	..	.7	..	4.9	4.9
Fall 1939	6.6	1.5	tr.	tr.	.5	69.4	..	.8	.1	..	11.0	.1	.8	tr.	3.6	5.5
Winter '39-'40	..	.	..	..	8.2	1.3	3.2	16.4	.6	..	53.2	..	3.2	..	6.3	7.6
Spring 1940	11.4	..	..	.6	1.7	1.7	4.0	8.6	1.7	..	45.1	..	2.3	..	8.0	14.8
Summer 1940	33.3	43.9	..	..	..	10.6	..	3.0	..	..	1.5	..	..	..	7.6	..
Fall 1940	3.3	..	1.7	..	6.7	6.7	..	15.0	..	..	46.7	..	1.7	..	5.0	13.3
Winter '40-'41	..	..	..	..	.9	.4	.9	31.3	.4	..	41.8	..	2.6	..	14.5	7.0
Spring 1941	1.8	..	..	..	..	10.9	3.6	16.4	..	..	34.5	..	1.8	..	7.2	23.6
Summer 1941	25.2	21.5	..	..	1.9	19.6	..	2.8	..	..	10.3	..	.9	..	3.8	14.0
Fall 1941	10.0	..	..	..	.6	36.9	..	3.9	..	..	27.9	..	.6	..	16.2	3.9
Winter '41-'42	..	..	.2	.4	2.7	.2	.7	10.1	1.6	..	60.5	..	1.8	..	12.6	8.6

AVERAGE RELATIVE SEASONAL ABUNDANCE

Winter	..	..	.2	.6	4.2	.6	2.3	20.8	.9	..	47.2	..	2.7	..	11.1	9.3
Spring	9.7	..	..	.3	1.6	12.1	3.1	11.2	1.0	tr.	32.1	..	1.5	..	9.7	17.4
Summer	25.8	30.0	.2	..	.6	22.5	..	3.3	.2	..	4.9	..	.5	..	5.4	6.3
Fall	6.6	.5	.6	tr.	2.6	37.7	..	6.6	tr.	..	28.5	tr.	1.0	tr.	8.3	7.6
Totals*	7.1	2.7	.1	.2	1.6	41.7	.8	6.7	.5	tr.	22.3	tr.	1.2	tr.	7.0	7.7

*Entire 39-months' period.

These are practically the only birds that might be confused with hawks in highway observation; the former might be mistaken for any of the larger hawks, while the latter are similar in size to the Sparrow Hawk. The unidentified hawks make up 7.7 per cent of all hawks observed, and the abilities of both of us as seen in our ratios of identified to unidentified birds are remarkably close. Excluding the large flocks of Swainson's Hawks, most of which were observed by Allan, there was less than 3 per cent difference in the ratios.

High points in the population curves of unidentified hawks (Figure 1) occur in August, September, and February. It is likely, therefore, that many of them are Swainson's Hawks in the fall, and that Marsh Hawks predominate in the spring.

Summary

Physiographic and climatic conditions in the Texas Panhandle present excellent opportunities for highway hawk-censuses.

During a highway census covering a 39-month period (1938-1942) 6,175 hawks (including kites, vultures and eagles) were observed in 26,768 miles of travel.

With Swainson's Hawks and Marsh Hawks far outnumbering all others, 15 species were recorded out of a possible total of 18.

Hawks were seen at the rate of 232.5 per 1,000 miles, or one bird per 4.2 miles.

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Soil Conservation Service, Washington, D.C., and U. S. Army, Lubbock, Texas

THE DOWNY YOUNG OF OYSTER-CATCHERS

BY J. DAN WEBSTER

IN the hope that knowledge of the natal down of young oyster-catchers might provide clues to the proper classification in the genus *Haematopus*, this study was begun in the fall of 1941. Through the kindness of the authorities of various American museums, most of the extant downy specimens were available for comparison.[1] Eight races were represented by excellent examples in a series of 48 true downies, plus six significant specimens in partial natal plumage; four other subspecies were represented by one chick each in partial juvenal plumage. Although we commonly expect the natal down of related species to be more similar than adult plumages, the downy plumages of all but one of the 12 forms I studied was individually characteristic.

The most recent review of the entire genus *Haematopus* is that by Peters (1934:231–34). Peters based his arrangement largely on the revision of the genus by Stresemann (1927) as supplemented by Salomonsen's revision of the European forms (1930) and Hartert's (1927) work on the New Zealand forms; Peters recognized 21 forms belonging to four species. Recently Falla (1939) showed that there were four species in the New Zealand region, where Peters had recognized but two forms, and considered them subspecies of the wide-ranging *Haematopus ostralegus*. In the present paper I have recognized as species two additional forms accorded only subspecific rank (as races of *H. ostralegus*) by Stresemann (1927) and by Peters. Thus I have returned to the older classification utilized by Murphy (1925) for the Western Hemisphere forms.

The natal down of oyster-catchers shows four principal colors, arranged in a fairly constant pattern. (1) Pure white down is present on more or less of the underparts in every form but *fuliginosus*. (2) Black down forms two parallel stripes down the back, a stripe at the top of the thigh, a dot on the lores, and a dot behind the eye; also spots and a median stripe on the pileum in some forms. (3) Some shade of drab down covers those areas of the upper parts which are not black, the throat, and (in the dark-bellied forms) most of the ventral surface.

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[1] The following museums and authorities courteously permitted the loan of specimens for study at Houston, Texas: American Museum of Natural History—Robert C. Murphy; California Academy of Sciences—James Moffitt; Museum of Comparative Zoology—J. L. Peters; Field Museum of Natural History (including the collection of H. B. Conover)—Rudyerd Boulton and H. B. Conover; Fuertes Memorial Collection at Cornell University—George M. Sutton; Los Angeles County Museum (including the collection of G. Willett)—George Willett; Museum of Vertebrate Zoology—Alden H. Miller; San Diego Natural History Society—Laurence M. Huey; United States National Museum—Herbert Friedmann.

Before I began the present study I had examined both adult and young oyster-catchers at the California Academy of Sciences, the Museum of Comparative Zoology, the Field Museum, Cornell University, and the Museum of Vertebrate Zoology. Valuable help during the course of this work was rendered by Dr. Asa C. Chandler as well as by the museum authorities listed above.

(4) Some of the drab down of the upperparts is tipped with a shade of buff.

Haematopus palliatus palliatus

I examined seven downy specimens from Virginia and South Carolina. The rump and flank tippings varied from Light Ochraceous Buff[2] to Ochraceous Buff (Ridgway's buff series runs: Pale Ochraceous Buff, Light Ochraceous Buff, Ochraceous Buff.); the lower back, wings, and face (that is, the auriculars and areas above and below the eye) were Avellaneous (a light, buffy drab). The sides and back of the neck were evenly Light Drab.

Haematopus palliatus pitanay

The single specimen examined from Peru was about three weeks of age; no differences in natal plumage from typical *H. p. palliatus* could be detected.

Haematopus palliatus frazari

I examined thirteen specimens from Lower California and Sonora. The rump and flanks were tipped with Light Ochraceous Buff; the lower back, face and wings were near Avellaneous, although varying from the true Avellaneous occurring in *H. p. palliatus*, to a slightly grayer shade. The sides and back of the neck were Hair Brown to Chaetura Drab. (Ridgway's Drab series is: Pale Drab Gray, Drab Gray, Light Drab, Drab, Hair Brown, Chaetura Drab, Chaetura Black.) Three or four small black spots were present on the pileum of three specimens, but such spots were in no case so extensive, so numerous, or so anteriorly placed as in the Old World oyster-catchers (see below). Bancroft (1927:52) mentioned and figured two *frazari* chicks from Scammons Lagoon, Lower California, which were the offspring of one normal plumaged, and one "black-bellied", *frazari* parent. These downies were collected by Laurence M. Huey, and formed part of the series of specimens I used. One member of the pair (San Diego Society Natural History 10538) was an average *frazari* chick, perfectly matching specimens from the Gulf of California. But the other (S.D.S.N.H. 10537) had several black spots on the back of the head (a character shared by two other *frazari* chicks in my series) and largely Drab Gray underparts. There was a triangular white patch on the upper breast, as in *bachmani*, but the ventral dark down was much lighter than in chicks of that species (Drab Gray rather than Drab).

Haematopus palliatus galapagensis

Examination of a chick entirely in the natal down may point to recognition of this large-footed form as the full species originally

[2] Throughout this paper, capitalized color names are used only where the color of the area described has been compared and identified with Ridgway's (1912) color key.

described by Ridgway (1886:331). The single specimen available (American Museum of Natural History, 735002) was about three weeks old when taken; it was the same one described by Rothschild and Hartert (1902:42) and referred to by Murphy (1936:982). The down of the throat was darker (Chaetura Drab) than the darkest *frazari;* the down of the back seemed to be Drab. The down remaining on and near the rectrices lacked the buffy tippings found in *frazari* and *H. p. palliatus,* and thus the entire tail was a dense black.

Haematopus bachmani

Of this species I examined 15 specimens from Alaska, British Columbia, and California. Unfortunately, the only young specimen available from the Santa Barbara Islands (George Willett's No. 752) was a bird nearly three weeks old. Down still present on this specimen seemed to be identical with that of northern chicks. The Light Ochraceous Buff or Ochraceous Buff tipping was in this species less extensive than in *palliatus,* resulting in a change in the ground color of lower back, wings, and face from Ridgway's brown series (e.g., Avellaneous, as in *palliatus*) to the drab series, accompanied by a darkening to Drab. The sides and back of the neck were very dark—Chaetura Black.

The most obvious and constant difference between the two species, *bachmani* and *palliatus,* so far as natal plumage was concerned, was in facial coloration. The side of the head of a *palliatus* subspp. chick was pale, almost buffy; that of a *bachmani* youngster (Webster, 1941: 156, fig. 6) was dark. The propriety of recognizing *bachmani* as a full species is questionable. I am sure that *bachmani* and *palliatus* are more closely related to each other than are *palliatus* and *ostralegus.* But until intergradation has been demonstrated in Lower California, where the two forms are co-resident, I hesitate to call them conspecific.

Haematopus ater

I examined three specimens, from Chile and the Falkland Islands. As Murphy (1925:15 and 1936:989) noted, the white ventral area, although much more extensive than in *bachmani,* did not cover the entire belly and flanks as in *palliatus.* Peculiar to this species was the restriction of Pale Ochraceous Buff tippings to very narrow strips along the margins of the dorsal and femoral black stripes. This localization of brown pigment resulted in a Mouse Gray color of back, lower belly, and head.

Haematopus leucopodus

Two specimens, from Tierra del Fuego and the Falklands, were examined. The chief point of interest was the remarkable similarity to *occidentalis,* from the British Isles. The pileum was prominently marked with black; the back was Drab, tipped sparsely with Ochraceous Buff; the upper breast, the throat and the sides of the neck were

Hair Brown. This species could, however, be differentiated from the downy English oyster-catcher (*H. ostralegus occidentalis*) by the basally black toenails and dark colored upper breast. The adult of this species has peculiar short toes and broad nails, but no trace of such characters could be detected in the chick.

Haematopus ostralegus occidentalis

I examined seven specimens from the British Isles of this, the best-known of all oyster-catchers. In view of the alleged relationships between this form and *palliatus* (Murphy, 1925:2–4 and 1936:973–74; Stresemann, 1927:72–73) it is interesting that the New World species most closely resembling it in natal plumage are *leucopodus* from the South Atlantic and *bachmani* from the North Pacific rather than *palliatus* of eastern North America. The entire upperparts and face were Drab (save for the usual black stripes); the sparse tippings of the upperparts were Ochraceous Buff. The sides of the neck were Hair Brown, and the pileum was prominently spotted with black, as in *leucopodus,* but the sooty brown of the throat did not extend onto the breast as in that species.

Although I examined no downy young of *H. o. malacophaga,* from Iceland, it seems reasonable to assume that few differences in natal down would have been found, because adult *malacophaga* are differentiated from adult *occidentalis* solely on the basis of size (Salomonsen, 1930:56).

Haematopus ostralegus longirostris

The single specimen available, from Western Australia, was over three weeks old. The down left on the neck and throat was darker than that of *reischeki* (see below) and lighter than that of *occidentalis.*

Haematopus reischeki

This form of New Zealand oyster-catcher has recently (Falla, 1939:263) been assigned specific status, although several earlier workers, *i. e.,* Stresemann (1927:77), Hartert (1927:16) and Oliver (1930: 278), regarded it as some kind of color variant or hybrid. Falla's studies led him to suggest (1939:264) that this form of oyster-catcher, from northwestern New Zealand, was more closely allied to *H. ostralegus longirostris* from Australia than was any other New Zealand species. But Falla, although he photographed a nest of newly hatched young (1939:266, fig. 2) was unable to collect specimens for a description of the natal plumage.

A single specimen (A.M.N.H. 735098) bore the label, "*Haematopus unicolor;* Kaipara Beach, near Helensville, North I., N. Z.; Robin Kemp, Jan. 9, 1915; stolen from a stoat; beak greenish gray, irides black, feet gray." Because Falla listed *reischeki* from Helensville, and indicated the hatching time of this species as January, it may be

presumed that this specimen was the undescribed natal form of *reischeki,* and that the designation *"unicolor,"* on the label indicated black or largely black parents. This chick was paler than even the lightest *palliatus* is gray brown and *ater* is sooty brown. The sides of the neck World forms, in marked contrast to the adult plumages of these species. For in the adult plumages *reischeki* is glossy black dorsally, whereas *palliatus* is gray brown and *ater* is sooty brown. The sides of the neck were Mouse Gray, the back largely Light Drab, the down tippings Pale Ochraceous Buff.

Haematopus finschi

Although I examined no specimens of this form (native to South Island, New Zealand), which was well described in the natal plumage by Falla (1939:261), it might be mentioned that his description is very similar to that of *reischeki* given above. His figure (1939:266, fig. 1), however, suggests that *finschi* is somewhat darker, and more gray, than downy *reischeki.*

Haematopus fuliginosus

I examined two specimens, one from Bass Strait, the other from Western Australia. This species was peculiar among downy oyster-catchers in its even, rusty coloration (although the black marks on the pileum were plain) and in its complete lack of white plumage. The belly was Light Drab; the neck, throat and back were Hair Brown; the tippings of the dorsal down were Wood Brown.

Haematopus unicolor

Falla (1939:265) restricted the name *"unicolor"* to entirely black oyster-catchers from the rocky shores of southern and middle New Zealand. Oliver (1930:279) described the downy chick of this form as, "covered with blackish brown down," a description which would fit *fuliginosus;* in the single specimen I examined (A.M.N.H. 735143; no locality but "New Zealand"; largely in juvenal plumage), down remaining on the head and neck was only slightly lighter than that of *fuliginosus;* down left on the lower back was nearest Hair Brown, perhaps very slightly lighter than that of *fuliginosus.*

Discussion

Murphy (1925:2–4) showed that the adult of *palliatus* has retained essentially the juvenal plumage-phase of European *ostralegus,* differing chiefly in the extent of the white spotting of the primaries, a variable character which is associated with geographical distribution in oyster-catchers throughout the world. The differences between New World and Old World oyster-catchers are given in Table 1. It is my opinion that the two should not be regarded as conspecific.

TABLE 1

COMPARISON OF NEW AND OLD WORLD OYSTER-CATCHERS

	NEW WORLD FORMS	OLD WORLD FORMS
	Adults	*Adults*
Irides:	yellow	red
Feet:	white or white tinged with pink	red
Back:	brown (except *leucopodus*)	glossy black
Rump:	brown or black	white (except *reischeki* and black-bellied forms)
	Downy Young	*Downy Young*
Nails:	dark at base	light at base
Pileum:	unspotted, or slightly spotted with black (except *leucopodus*)	spotted and streaked prominently with black

SUMMARY

Comparison of 54 specimens of the genus *Haematopus* in natal plumage led to the following original conclusions: *H. palliatus frazari* chicks are darker than those of the nominate race and tend to be marked more often with black on the parietal region. *H. bachmani* chicks have a dark, drab face; *H. palliatus* subspp. chicks have a pale, buffy face. Chicks of *H. ostralegus occidentalis* and *H. leucopodus* are very similar.

Several differential characters (of both adult and young) are listed which distinguish Old World and New World oyster-catchers.

H. leucopodus from the Falkland Islands and South America seems to be the nearest thing to a living connecting link between eastern hemisphere and western hemisphere forms. In this species the plumage of both adults and young is close to the Old World type, the adult flesh colors are those of the New World type, but the configuration of the adult toes and toe-nails is unique.

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MYRON HARMON SWENK
1883-1941

BY JOHN T. ZIMMER

MYRON HARMON SWENK, Chairman of the Department of Entomology at the University of Nebraska, died at his home in Lincoln, Nebraska, on July 17, 1941. He was born at Polo, Illinois, on August 8, 1883, the son of Howard Swenk and Susanne Harmon Swenk. In 1885, the family moved to Beatrice, Nebraska, in whose public schools Myron received his preparatory education, graduating from the Beatrice High School in 1901. That year the family moved to Lincoln, where he entered the University of Nebraska and began his studies in the Department of Entomology under Professor Lawrence Bruner. He graduated with the degree of Bachelor of Arts in 1907 and received that of Master of Arts in 1908.

While an undergraduate, in 1904, Myron became Laboratory Assistant in Entomology. He was raised to the position of Adjunct Professor in 1907, Assistant Professor in 1910, Associate Professor in 1911, Professor of Economic Entomology in 1914, and Professor of Entomology in 1925, and was made Chairman of the Department of Entomology in 1919, in which capacity he served until July, 1941, a short time before his death, when ill health compelled his retirement from active duty. He also served the University on various committees and from 1912 to 1928 was Chairman of the Committee on Graduate Work on the Agricultural College Campus.

In addition to his pedagogical work, he was long associated with the Nebraska Agricultural Experiment Station, as Assistant Station Entomologist (1913-1919) and Entomologist (1919), and was also Assistant State Entomologist (1908-1919) and State Entomologist (1919-1927).

On April 24, 1918, he married Jane Chandler Bishop of Lincoln who, with his father and a sister, Iva Swenk, also of Lincoln, survives him.

Myron Swenk's chosen profession was entomology and his work in this subject, aside from his classroom activities, was primarily in the economic field, as was but natural in view of his official positions in an agricultural state. His numerous publications on economic entomology were begun while he was still an undergraduate student and continued throughout his lifetime, but they alone do not measure the full extent of his services to the farmers of Nebraska. The problems of the control of the insect enemies of the fields and orchards were his constant study. As a taxonomist, he was interested primarily in the bees, and most of his papers on systematic entomology deal with that group of insects. Their role in the pollination of plants was a phase of the subject that, from early years, drew his careful attention.

Entomology was closely seconded by ornithology as an avocation in which Professor Swenk played a very active part throughout his lifetime. He was one of the founders of the Nebraska Ornithologists' Union when it was instituted on December 16, 1899. He was elected its President in 1907-1908, Secretary in 1908-1910, Secretary-Treasurer in 1910-1912 and again from 1915 to 1937, and Editor-Custodian (1938-1941). He secured the affiliation of the Union with the Wilson Ornithological Club (1915) and served as President of the Club for the year 1918-1919. When the affiliation terminated in 1925 and *The Wilson Bulletin* ceased to be the official organ of the Union, he began the issue of a series of mimeographed "Letters of Information," of which sixty-eight numbers appeared. They contained the records of the activities of the Union and its members and supplied the place of a printed journal until *The Nebraska Bird Review* was initiated in 1933. The *Review* he continued to edit until early 1941. Thus, from the founding of the Nebraska Ornithologists' Union until his death, he served the society in one capacity or another and was editor of its publications for most of that time.

In 1904, under the joint authorship of Lawrence Bruner, Robert H. Wolcott, and Myron Swenk, there was published "A Preliminary Review of the Birds of Nebraska." This consisted of an annotated list of the birds recorded from the state, with keys for their identification; remarks on their distribution, seasonal occurrence, and abundance; and with citations of the records of the more uncommon forms. The account appeared in the Annual Report of the Nebraska State Board of Agriculture for the year 1903 and was immediately reissued in book form. It became the standard work of reference on Nebraska birds. Various additions and corrections have been published from time to time, several from the pen of Myron Swenk himself, but no more comprehensive account has appeared, and the book has not been supplanted. For many years, Swenk had in mind a complete descriptive work on the birds of the state, but it was not found possible to finance the undertaking, and it was never carried to completion. The biographer still has in his possession a portion of the manuscript notebooks that mark an early joint effort to assemble certain data for such a work.

Perhaps realizing that the more ambitious undertaking was out of the question, Professor Swenk began, in 1933, two series of articles in *The Nebraska Bird Review* entitled, respectively, "A History of Nebraska Ornithology" and "A Brief Synopsis of the Birds of Nebraska." These undoubtedly would have brought together a great deal of scattered information on the local bird life, but only four instalments of the "History" and three of the "Synopsis" were published before the author's death. Other articles from his pen were, however, both numerous and varied, ranging from simple records of local occurrences to such comprehensive studies as that on the Eskimo

Curlew (1915), the Whooping Crane (1933), the measurements of the geese of the *Branta canadensis* group (1934, 1935) and other important studies. Whatever the subjects or their importance, the articles are marked by the accuracy and careful attention to detail that characterize all of Myron Swenk's work.

Professor Swenk was interested in mammals to a somewhat lesser degree than in birds, but he has to his credit "A Preliminary Review of the Mammals of Nebraska" (1908), with three subsequent revisions of the list (1915, 1918, and 1920), and a number of other papers of taxonomic or economic interest, including the descriptions of five new mammalian subspecies. In 1939, he began a privately published series of papers on mammals under the general title of "Missouri Valley Fauna," of which three numbers appeared before his death.

He was affiliated with numerous scientific organizations including the American Association for the Advancement of Science, American Association of Economic Entomologists, American Ornithologists' Union, American Society of Mammalogists, Cooper Ornithological Club, Ecological Society of America, Nebraska Academy of Science, Nebraska Ornithologists' Union, Wildlife Society, and Wilson Ornithological Club, and the honorary societies of Alpha Zeta, Gamma Sigma Delta, Phi Sigma, and Sigma Xi.

As a teacher, Professor Swenk was exceptionally successful. His knowledge of his subject was profound, his manner of presentation clear and forceful, and he had the gift of inspiring his students to their best efforts. As a companion in the field he was genial, interesting, and alert, and it is a pleasure to recall many hours spent with him in past years, roaming the woods and fields, watching birds, collecting specimens, and discussing problems of mutual interest.

From his boyhood he was a keen, though conservative, collector, and he succeeded in building up an important private collection of some thousands of birds, mammals, and insects of the Missouri Valley region. After his death, the insects were presented by Mrs. Swenk to the Department of Entomology at the University of Nebraska, and the birds and mammals to the Nebraska State Museum. Mrs. Swenk has since expended considerable time and effort in cataloguing the birds and mammals in their new quarters and it is gratifying to know that, through her generosity, this material, of special value to Nebraskans, will remain in the state, accessible to students in the region. Local students will, however, miss the presence of Myron Swenk in person. His was the lasting flame that kept alight through the changing years of the Nebraska Ornithologists' Union and his the spirit that kept the organization a growing one. More than anyone, he made the Union his own, and the history of the organization for forty years is inextricably bound up with him. It will miss his guiding hand, his fund of information, and his unfailing interest in local problems which was at the service of Nebraska students. He left a foundation for

future work in the region for which all those who remain to carry on his work will feel extremely grateful.

In *The Nebraska Bird Review* (Vol. 10, No. 1: 6-15, July 7, 1942) will be found a bibliography of Myron Swenk's publications prepared by Dr. H. Douglas Tate, and in the same number (pp. 15-22) an additional paper (with Edson Fichter) on "The Distribution and Migration of the Solitary Sandpiper in Nebraska."

AMERICAN MUSEUM OF NATURAL HISTORY, NEW YORK CITY

BIRD MIGRATION. By A. Landsborough Thomson. H. F. and G. Witherby, Ltd., 326 High Holborn, London, W. C. 1. 1942: 7 x 4½ in., 192 pp.; 7 photographs and 13 maps. 6s.

In this revised edition, Landsborough Thomson has brought up to date the useful short account of bird migration he originally published in 1936. Type for the new volume has been more closely set, reducing the total number of pages but not the text. The new edition is also printed on a cheap wartime pulp. About four pages of material and several maps have been added.

Ornithologists will be more interested in the new contents of the book than in its physical make-up. Brief accounts are given of the recent studies on homing (by Rüppell, Wodzicki, Lockley, and Griffin) and of the work of experimental biologists (Rowan, Bissonnette, and Wolfson). Mention is also made of the banding results of Nice, B. Roberts, R. J. Middleton, and others. These appear to be the three fields of inquiry currently yielding the most significant facts on bird migration.

Popular books on this subject have one fault in common. Designed for the general reader, they emphasize "the immensity of migration" and its complexity, and suggest little to the bird watcher in the way of concrete studies that he himself can carry out in the field. To a considerable extent this is attributable to the ideal of condensation that has governed recent books on bird migration. F. C. Lincoln summed up the subject in about 65,000 words in 1939; Thomson here covers it in about 50,000. Such a condensation also necessitates the omission of many aspects of a field that is admittedly complex. To the reviewer, the present volume is regrettably vague on the subject of the periodic irruptions studied by Gross, Formosof, and Speirs.

In spite of this, the book can be considered the best general statement of bird migration now available for the layman. Although British birds have deliberately been allowed to predominate as examples, a check of the excellent index reveals that about 43 per cent of the species listed are probably known to the average bird student in North America. Supplemented by Lincoln's pamphlet of 1935 (U. S. Dept. of Agriculture Circular, 363), it therefore offers American readers an inexpensive and up-to-date summary of the general features of bird migration and of our present theories on the subject.—J. J. Hickey.

ELMER T. JUDD, NORTH DAKOTA ORNITHOLOGIST

BY O. A. STEVENS

NORTH DAKOTA ornithologists have not been numerous, and the death of Elmer T. Judd made a notable gap among them. He was born at Bethel, Connecticut, on June 16, 1866. Even as a boy, he was interested in bird life, and attended meetings of the early and short-lived New Haven Ornithological Club. He came to North Dakota, then still Dakota Territory, in 1887, and settled on a farm eight miles north of Cando, Towner County. This area, situated in rolling prairie country, with many ponds but no streams, far enough north and east to be out of the dry plains region, is admirably suited to encourage ornithological pursuits. Devils Lake, the largest lake in the state, with well wooded edges, is about 40 miles southeast. The Turtle Mountains are about the same distance in an opposite direction, and Rock Lake, a fine large prairie slough, is about 25 miles directly north.

Judd must have sent back to the east glowing descriptions of the bird life of the virgin prairies, for toward the middle of April, 1895, Dr. L. B. Bishop of New Haven, Connecticut, W. H. Hoyt and John Shaler of Stamford, Connecticut, and Homer L. Bigelow of Boston, Massachusetts, came out prepared to study birds in earnest and stayed until the first of August. Dr. Bishop has kindly furnished me the following notes on the visit, which describe the country as an ornithological field and give an intimate picture of Judd.

"Judd was our guide, counsellor and friend, most efficient cook, housekeeper, and driver. After some ten days in Cando, we moved to a small house on Rock Lake, 23 miles north, kindly lent us by Dr. George W. Vaughn of Cando. There were passed some of the happiest days of my life, and most productive ornithologically. The country was unbroken prairie, full of birds, with almost no habitations of white men for 30 miles or more around, farther than we could see or drive. All was our own to collect in a paradise of strange birds, and enjoy in perfect freedom; and we made the most of it.

"With Judd's little bronchos, we roamed the countryside, and studied birds together. Judd drove us, cooked for us and tried to keep us in some order. As the days passed we learned to know him more intimately, admired his sterling honesty of purpose, and his unfailing patience and good temper, and we felt we had left a sincere friend when destiny called us home.

"I spent the summer of 1901, 1902 and 1905 with Alfred Eastgate and his family at Stump Lake, and we scoured all the country northwest to the middle of the Turtle Moutains, collecting. But in 1905 we found all the country, where I formerly roamed in freedom, filled with farms, flax and wheat. East of Rock Lake, where in 1895 there was not a building as far as the eye could see, I counted about 200 farm

buildings in sight from one point across Rock Lake."

The work of that summer of 1895 and the observations of E. S. Bryant (1894) were used in Judd's "List of North Dakota Birds" (1917), published privately at Cando, which listed 255 forms from the area. Among these were Hoyt's Horned Lark and the Dakota Song Sparrow, which had been collected by the party; Bishop (1896) had named the Song Sparrow for Judd and the Horned Lark for Hoyt. Some years later, Bishop (1921) also described the Lesser Loon from the collections made that summer.

Judd did some collecting himself, but I am uncertain about the amount. Mr. J. E. Graf, Associate Director of the U. S. National Museum, informs me that the museum has in its collections a skin and two sets of eggs of Baird's Sparrow, three skeletons of Prairie Chicken, five sets of eggs of Chestnut-collared Longspur, one set each of the Shoveller and McCown's Longspur, all collected by Judd. The collections of Bigelow passed to the Museum of Comparative Zoology at Harvard College. The extensive collections of skins made by Bishop went to the Field Museum of Natural History in Chicago in 1939, the eggs to the Peabody Museum of Yale University a few years later.

This part of North Dakota has been visited and described by other ornithologists—Herbert K. Job in 1898, A. C. Bent, Bishop and Job, in 1901, and Vernon Bailey and Florence Merriam Bailey in 1913 and 1917. In 1921, Norman A. Wood, of the University of Michigan, visited North Dakota while preparing a list of the birds of the state (1923), and he has kindly sent me the following notes:

"While engaged in a preliminary survey of the bird life of North Dakota in 1921, with headquarters at the Biological Station (of the University of North Dakota, since discontinued) at Devils Lake from May 2 to July 25, Mrs. Wood and I were delighted with a visit from Mr. Judd, who invited us to his home at Cando on June 1st. After a few short trips about Cando in his auto (no longer the bronchos), he drove us north, to and across the boundary line in the same region where Coues worked in 1873, and took a large series of Baird's Sparrow (and where I took my only specimens of this species).

"Another auto trip was made with him to the fish hatchery at Fish Lake in the Turtle Mountains, where we took specimens of the Dakota Song Sparrow in the type region. On May 28, 1921, Mr. Judd drove us to the Sully's Hill National Park and to the Indian Reservation near there. We enjoyed his company and great knowledge of the bird life of the state. Mr. Judd was well known and respected throughout the state, and his passing is a great loss to all who knew him and especially to me who knew him so well."

Before his paper of 1917 Judd had published three notes on game birds (1891, 1892, 1893) in *Forest and Stream*. I have been unable to find record of any further publications by him, but he continued active

in promoting the conservation of bird life. He was State Game and Fish Commissioner from 1922 to 1924 and president of the North Dakota Audubon Society from 1924 until his death. My own acquaintance with him began about 1925. He was a frequent visitor in Fargo, and we had a number of pleasant discussions. We carried on quite an active correspondence from 1924 to 1926, when he read the manuscript for my own publication (1926), which of course made much use of his. He died at Bismarck, North Dakota, on February 27, 1940, and was buried at Cando, North Dakota.

He became a Master Mason in January, 1890, and his life has been well described by Walter L. Stockwell, Grand Secretary and Librarian (1941).

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GENERAL NOTES

Least Bittern at Long Lake, North Dakota.—Because of the paucity of records of this bird in North Dakota, it seems desirable to report an observation of the Least Bittern (*Ixobrychus exilis*) at Long Lake near Moffit, Burleigh County, North Dakota, August 28, 1942. The bird was flushed from a dense growth of *Scirpus acutus*. It flew within 20 feet of me and then disappeared into another stand of bulrush. Light conditions were excellent, and there seemed no possibility of mistaken identification.—CLARENCE COTTAM, *Fish and Wildlife Service, Chicago, Illinois.*

An Ohio Record of the Surf Scoter.—On October 7, 1942, we collected a female Surf Scoter (*Melanitta perspicillata*) on Lake Erie, between South Bass and Middle Bass Islands, Ottawa County, Ohio. The bird was several hundred yards from shore, and during a half hour of observation was seen to feed only by dabbling in the manner of a shoal-water duck.

The total bulk of the stomach contents was 21 cc., of which 20 per cent was fine gravel; 20 per cent, plant material (parts of rhizomes, and three *Potamogeton* seeds); 60 per cent, parts of invertebrates. The recognizable portions of the invertebrates consisted of: pieces of the shells of 8 small snails; at least 42 cucumber beetles (Chrysomelidae); 2 ham beetles (Corynetidae); one rove beetle (Staphylinidae); one ground beetle (Carabidae); one water beetle (Hydrophilidae); one predacious diving beetle (Dytiscidae); 12 large hornets (Vespidae); 2 wasps (Psammocharidae); 3 chinch bugs (Lygaeidae); one stink bug (Pentatomidae). The preponderance of adult land insects is interesting, since Bent (*U. S. Nat. Mus. Bull.*, 130, 1925:148) and other authors state that even on interior lakes the Surf Scoter's food consists principally of molluscs, crayfish, nymphs of aquatic insects, and a small amount of vegetable matter, and is obtained chiefly by diving.

The Surf Scoter is apparently the rarest of the three species of scoters found in Ohio, and there are few published records. This skin is deposited in Ohio State Museum.—MILTON B. and MARY A. TRAUTMAN, *F. T. Stone Laboratory, Ohio State University, Put-in-Bay, Ohio.*

Remains of the Wild Turkey in Wisconsin.—The Oshkosh Public Museum has a large collection of bird bones recovered from the Indian refuse pits on the eastern shore of Lake Winneconne, Winnebago County. The writer was instrumental in having these bones sent to Alexander Wetmore for identification. Among the bones were four metacarpals of the Wild Turkey (*Meleagris gallopavo silvestris*). This is striking confirmation of the statement of Allouez (*Wilson Bulletin*, 54, 1942:175) that he found Wild Turkeys at Lake Winneconne in 1670. Thanks are due to Dr. Wetmore for the labor involved in working over the large mass of bones.—A. W. SCHORGER, *168 North Prospect Avenue, Madison, Wisconsin.*

Two Long-eared Owl Nests near Toledo, Ohio.—The Long-eared Owl (*Asio wilsonianus*) has been regarded as a rare winter visitor in the Toledo region, with a decided preference for dense evergreen cover (L. W. Campbell, "Birds of Lucas County," 1940), although nests have been recorded in 12 northern Ohio counties.

Then, in the spring of 1942, Laurel Van Camp discovered two nests in small deciduous woodlands in this area. The first was found April 11, in a grove of small trees surrounded by level tilled country, in Sandusky County, near Kingsway, not far from the Sandusky River. It was apparently an abandoned Crow nest, relined with strips of bark, and was placed at a height of 20 feet, against the trunk of a red maple. When discovered April 11, the female was brooding. Five

nestlings, the smallest not over three days old, were present April 23, but only four on May 8, the fifth having fallen to the ground. Although the pellets revealed nothing but meadow mice *(Microtus)* remains, a half-eaten small rabbit lay on the nest at the time of the last visit.

A second nest of similar construction and location, but in a small pin oak, was found May 9, near the base of Little Cedar Point, Lucas County, in a wood that did not exceed ten acres, lying between an extensive Lake Erie marsh and level open farm land. There were six nestlings. Comparison with the young in the other nest led to the conclusion that these had hatched about April 18. On May 16, they were able to crawl out on limbs when approached. When the nest was visited May 23, the adults were near, but the young were not found. We believe that they left voluntarily. On the rim of the nest lay a partly plucked Yellow-throated Vireo *(Vireo flavifrons)*.—LAUREL VAN CAMP, *Genoa, Ohio,* and HAROLD MAYFIELD, *3311 Parkwood Avenue, Toledo, Ohio.*

Evidence for the Former Occurrence of the Ivory-billed Woodpecker in Ohio.—The Ivory-billed Woodpecker *(Campephilus principalis)* was found years ago in Franklin County, Indiana, adjacent to the southwestern corner of Ohio, and on this basis it has been carried in the hypothetical list of birds for the latter state, on the logical assumption that formerly it must have occurred there. There have been no positive records for it, however.

Recently Robert Goslin has sent to me for identification a set of birds' bones excavated in 1940 and 1941 by H. R. McPherson of Columbus, Ohio, from the Feurt Village Site in Clay Township, Scioto County, Ohio, east of the Scioto River, and not far from the Ohio River, which marks the southern boundary of the State. The material is presumed to date back to the fifteenth or sixteenth century, since it was found at one of the sites of the Fort Ancient Culture.

Among the 24 species of birds included in this collection I was interested to find a metatarsus of the Ivory-bill (now preserved in the osteological collections of the U. S. National Museum). It appears to me that this constitutes a definite record for the former occurrence of this bird in Ohio. It is true that the Ivory-bill was considered of some value by the Indians, who without question carried the heads and bills about, using them in medicine bundles and in other ways. It seems hardly probable, however, that the foot (which was of no particular interest) would have been taken to a locality distant from where the bird was killed.

Other interesting species whose bones are found in this deposit are the Prairie Chicken *(Tympanuchus americanus)*, the Passenger Pigeon *(Ectopistes migratorius)* and the Raven *(Corvus corax)*. The deposit also contained remains of two other woodpeckers, the Pileated Woodpecker and the Flicker.—ALEXANDER WETMORE, *Smithsonian Institution, Washington, D. C.*

Roosting Habits of the Verdin.—For several summers I have observed the Verdin *(Auriparus flaviceps)* at Hot Springs, Brewster County, Texas. In this rough, dry country it is a common resident along chaparral-lined arroyos of the lowlands, and its compact nests are easy to find. Noting, almost invariably, an accumulation of excreta at the nest-entrance, I found myself wondering about the species' roosting habits.

Frequently during the last hour of daylight I came upon a nest with a protruding tail visible at the outer edge of the tunnel-like doorway. By cupping my hand over the nest-hole, I succeeded in capturing a bird now and then. Of five finally captured thus, all were adult. Every attempt to capture roosting birds not in such a "tail out" position failed.

At dusk on July 2, 1942, I found a nest with two tails showing in the entrance, and succeeded in capturing both birds, which proved to be young of the year. (At the same nest I had caught an adult on August 17, 1941.) The two immature birds

and the branch of granjeno *(Celtis pallida)* supporting the nest were brought indoors and placed in a cage.

During the first night the captives roosted on the twigs just under the nest. On the following night and every night thereafter they slept in the nest, tails pointed out the doorway. During the morning of July 8 they tore a small hole in the nest dome. At 10:30 that evening I flashed a light through this opening and discerned the birds sleeping side by side, each with head under scapulars and tail extending through the doorway. This was their sleeping position each night until they were released on July 12—to the excited *tschep-tscheps* of an adult pair, presumably the parent birds, that had been keeping daily vigil at a window near the cage.—LOVIE M. WHITAKER, *210 Plaza, Las Vegas, New Mexico.*

An Unusual Nest of the Bronzed Grackle.—On April 16, 1941, as I was walking through an old apple orchard, a Bronzed Grackle (*Quiscalus quiscula aeneus*) flushed from a hole in one of the trees. On investigating the hole I found the Grackle's nest and four eggs. It was apparently an old Flicker hole, enlarged by decay and further excavating. The orchard was partly surrounded by large pine trees, planted many years ago as a windbreak. Several pairs of Grackles were nesting in the pine branches. I was surprised to find this one pair nesting in a hole, with so many of the pine trees they usually favor close at hand.—CLARK K. LLOYD, *2712 Hoover Avenue, Dayton, Ohio.*

Snakes Destroying Birds' Eggs and Young.—Although during a period of a few years the average bird student may find many bird nests whose contents are destroyed, he rarely happens to visit a nest at the time of the destruction. I have had a number of such experiences involving snakes as the predators and list them in the order in which they occurred.

On July 27, 1930, when passing a friend's house in Battle Creek, he called me into the yard, explaining that a snake had eaten four well-grown Chipping Sparrows *(Spizella passerina passerina)* from a nest four feet from the ground in a grapevine in their yard. The snake, a Common Garter Snake *(Thamnophis sirtalis sirtalis)*, lay dead beside the grapevines, and when dissected proved to contain the remains of one of the Chipping Sparrows, the others having probably jumped out of the nest the minute the snake captured the one.

On June 5, 1941, while studying birds along the bank of the Battle Creek river, in Convis Township, Calhoun County, Michigan, I found a nest and five eggs of a Prothonotary Warbler *(Protonotaria citrea)* in the hollowed end of a branch of a fallen maple tree. On June 19 at 2 P.M. I found both birds scolding a Pilot Snake *(Elaphe obsoleta obsoleta)* which was wrapped around the end of the branch with its head inside the opening that contained the nest. When killed, he was found to contain all five young of the Prothonotary Warbler, which were about two days old. The nest was only two feet from the ground, 159 feet from the river, in the bottomland area. The snake was identified by Morris Aiken of the Battle Creek Public School Museum.

While visiting the Bernard W. Baker Sanctuary in Convis Township, Calhoun County, on August 17, 1941, I heard the continued scolding notes of a Goldfinch (*Spinus tristis tristis*) on a side-hill south of the marsh, where I found the bird, a male, so interested in something that he did not note my approach until I was within three feet. The Goldfinch nest was located in a small hawthorn tree about four feet from the ground. Underneath the nest was a young bird, still unable to fly. On the opposite side of the tree was a five-foot Blue Racer *(Coluber constrictor flaviventris)*, which I soon captured. With slight pressure, another young Goldfinch, the size of the one found on the ground, was forced from the mouth of the snake.—LAWRENCE H. WALKINSHAW, *Battle Creek, Michigan.*

EDITORIAL

The color plate with which we begin this new volume is financed largely by the proceeds from the auction, at our Urbana meeting, of a number of George Sutton's original drawings and paintings generously donated for this purpose by the artist. This plate is an important contribution to scientific knowledge and, incidentally, it will bring back happy memories to those of us who were privileged to participate in that memorable auction presided over by the forceful and persuasive James Boswell Young.

The Wilson Ornithological Club starts the year 1943 with sober prospects of rising publication costs and an increased rate of membership loss, at least among certain classes of members, such as those leaving for service overseas. Richard L. Weaver and his Membership Committee are working steadily, but they will need more help from our members throughout the country if they are to make a complete success of their task.

Members can also help by raising their own membership class. No one need hesitate to take out a Life Membership because of any apparent conflict with the War Bond campaigns, for the Club's receipts from Life Membership dues are being invested in those same War Bonds.

We are greatly indebted to Ruth D. Turner for her prompt and accurate work in preparing the index for the 1942 volume of the *Bulletin*.

We ask contributors not to try to pay for reprints in advance. It is rarely possible for an author to guess the exact amount of the bill, and his attempt, however well intended, only complicates our problem. Galley proof on articles, notes, and reviews is always sent to authors, and an inquiry is made at that time about possible reprint needs. The reprints are made soon after the *Bulletin* is published and then the type is taken down. It is therefore impossible to fill reprint orders received after the date of publication. Reprints are sent to the author by the press, usually within three weeks. Immediately afterward bills for the reprints, transportation, and tax are sent out to the authors. Finally, we remind you that there is a minimum of 100 on reprint orders. The price scale is printed inside the back cover of every *Bulletin*.

Ornithological News

The American Ornithologists' Union has awarded the Brewster Medal to Margaret M. Nice for her study "Life History of the Song Sparrow."

Ruth D. Turner, formerly at the New England Museum of Natural History in Boston, has accepted a position in the Zoology Department of Vassar College.

Prof. C. W. G. Eifrig, a member of our Club since 1907, has retired from active work at River Forest, Illinois, and has moved to Windermere, Orange County, Florida. He began his ornithological work in 1895 near Pittsburgh, but later moved to Cumberland, Maryland, and then to Ottawa, Canada; for the last 33 years he has been in northern Illinois. He has published extensively in *The Wilson Bulletin* and elsewhere. For 14 years he served as president of the Illinois Audubon Society.

ORNITHOLOGICAL LITERATURE [1]

THE IVORY-BILLED WOODPECKER. By James T. Tanner. National Audubon Society Research Report No. 1: xii + 111 pp., colored frontispiece and 20 pls., 22 figs. October, 1942. Paper covers. $2.50.

We welcome the inauguration of a series of research monographs by the National Audubon Society. That very active and progressive society rightly "considers facts obtainable through scientific research the essential basis for wise policies governing the conservation of wildlife." Ornithologists had strikingly failed to secure the necessary information on this magnificent species, and so the Society itself initiated an intensive study. The extent of the previous neglect of the Ivory-bill is almost incredible. We note that: the latest and most complete study of the Ivory-bill's anatomy was published by Audubon in 1839; the only published record of the weight of an Ivory-bill was by Catesby (1731); the food contents of but three stomachs were ever saved; and neither the incubation nor nestling period had ever been recorded.

As John H. Baker says, the choice of James Tanner was a happy one. This report demonstrates clearly his energy, intelligence, and scientific attitude of mind. From 1937 to 1939 he spent 21 months in the field, traveling more than 45,000 miles and visiting 45 widely separated localities ranging from South Carolina and Florida to Louisiana and Texas. He makes little mention of the physical hardships involved, and few of his readers will realize the labor and risks of such a campaign in southern swamp forests. His thorough coverage of the published material while preparing his report is demonstrated in the accurate bibliography of 153 titles.

The report includes sections describing the bird itself, its habitat requirements and geographical distribution (with 18 maps), the history of its disappearance from most of the original range, its present numbers, its breeding habits, and its conservation. One important section is that devoted to the Ivory-bill's food and feeding habits. Naturally, since it was out of the question to collect specimens, this account suffers from the scarcity of material, but Tanner has by great ingenuity and industry done much to overcome the handicap. For example, he has even attempted (and apparently with considerable success) to analyze forests from a woodpecker's point of view, taking into account the botanical composition of the forest, the proportion of insect-harboring wood, and the insect populations. We should perhaps mention that the locality record of Moseley's Ivory-bill (which Tanner quotes from Cottam and Knappen's food habits paper) is just another example of the errors which appear with such disturbing frequency in the records of the Fish and Wildlife Service. "Bowling Green" is actually just the collector's home town in Ohio and not the Louisiana home of that Ivory-bill (which Moseley took 18 miles north of Holly Ridge, a station on the Vicksburg-Shreveport railroad).

We find little about the Report to criticize. Tanner seems to have examined but 91 of the 200 to 250 specimens which he estimates to be in the museums of this country, and yet in his discussion of plumages and molts, for example, he indicates that he was hampered by a shortage of material. The comparison of the Ivory-bill's "nesting success" (six nests) with Mrs. Nice's results on 211 Song Sparrow nests seems far-fetched. Throughout the paper Tanner uses the adjective "juvenal" indiscriminately, both in the sense that Dwight proposed when he introduced the word and as a synonym of juvenile. And finally, the price of $2.50 on a 123-page, paper-covered, bulletin is hard to understand.

Tanner concludes that "the collecting and shooting of Ivory-bills has not been a major cause of the species' decrease, has not been as important as the destruction of the Ivory-bill's habitat by logging. But now that there are so few Ivory-bills living, the shooting of a few birds might become the final cause for their extinction."

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[1] For additional reviews see pages 22 and 50.

Tanner has done a fine job, and the Audubon Society has published his report handsomely. However, the Ivory-bill is in a desperate situation. Will this report be allowed to serve as the Ivory-bill's obituary, or will conservationists follow the matter through so that state and federal agencies may act quickly enough to save the few small tracts of big timber where alone the Ivory-bill can survive?—J. VAN TYNE.

THE ROSEATE SPOONBILL. By Robert Porter Allen. National Audubon Society Research Report No. 2: xviii + 142 pp., colored frontispiece and 20 pls., 44 figs. December, 1942. Paper covers. $2.50.

This monograph, along with that of James T. Tanner on "The Ivory-billed Woodpecker," stems from the recently established research program of the National Audubon Society. It is definitely a scientific report, though it starts with the assumption that the Roseate Spoonbill should be—yes, must be—preserved as an element in the fauna of the United States. Since this magnificent and bizarre bird is shown to conflict to a negligible degree with man's economic welfare, this preconception will probably not be challenged from any responsible source. Nor will many be inclined to take issue with a second assumption, that the preserve and warden system of the Audubon Society has been an effective factor in the survival of the precariously small colonies in Florida and in the growth of the population in Texas. The author makes clear his belief, however, that an overflow from larger colonies in the Antilles and in Mexico has been mainly responsible for the maintenance of the species in the Southeast and for its increase in Texas. Just how the breeding populations to the southward have affected and will continue to affect the conservation of the species in the southern United States remains to be determined by further research. In the meantime rigid care and continued vigil are still required to prevent the extirpation of the species in the United States.

The vivid enthusiasm of a bird lover is not concealed between the printed lines of description and of cautious and critical interpretation. One wonders whether Allen's unquenchable delight over the sight of spoonbills exceeded his joy in scientific discovery. Whatever its basis, his enthusiasm overcame the discomforts and loneliness of living for months with these birds and their ecological associates.

This intimate contact with the Roseate Spoonbill has enabled the author to locate and to census all extant colonies in the United States, and hence to compare present-day habitats and populations with former homes and numbers, as reconstructed by a prolonged historical study. He has determined the facts of migration, further emphasizing the dependence of the Florida and Texas colonies on the stocks of lands to the south. He has worked out the prenuptial and the mating behavior in detail. He has determined also the six plumages, in a four-year cycle of development. Food has been treated at length, from the viewpoint of food-chains and general ecological relations.

In the matter of food one might criticize the author for drawing lengthy and involved conclusions from inadequate data, for he gives stomach analyses of only five birds. We realize, of course, that the need for protection was too strongly felt to warrant a large kill for food samples, and that the author's long observations of the feeding birds and his analyses of organisms in the feeding waters furnished much data on the spoonbill's probable diet. Again one might criticize a rather sweeping conclusion as to harm done by ectoparasites, when only four birds were autopsied. The discussion on the fishes that live in the feeding waters of the Roseate Spoonbill is marred by numerous slips and mistakes.

The treatment of "limiting factors" is a fine piece of applied ecology, and is the product of much study and honest thought. The conclusion is reached that man, long the most serious enemy of the spoonbill, "is now of negligible importance as a decimating factor in the U. S. portion of the range." Several "welfare" and several "decimating" factors are analyzed. No outstanding critical factor was discovered.—CARL L. HUBBS.

THE REPRODUCTIVE CYCLES OF THE BRITISH AND CONTINENTAL RACES OF THE STARLING. By W. S. Bullough. Phil. Trans. Roy. Soc. London, Ser.B, Biol. Sci., Vol. 231, No. 580:165–246. August 31, 1942.

This is a thorough, careful study based on the examination of 786 specimens of *Sturnus vulgaris* from Yorkshire, the majority taken from communal roosts in fall and winter. Detailed accounts, illustrated with sketches and microphotographs, are given of the reproductive systems of both sexes at different ages.

"It is shown that there are differences between the sedentary British starling and the migratory Continental bird in the seasonal variations of these systems. The gonads of the first-year British and Continental starlings begin to grow in February, but the rate of growth in the British bird is greater than that in the Continental. The gonads of the adult British starlings do not regress so far in summer as those of the Continental birds, and they start to grow precociously in early autumn. The gonads of the adult Continental starlings do not begin to grow until January or February, the time when the gonad growth of the British birds is accelerated. In February and March the gonads of the adult British birds grow much more rapidly than those of the Continental birds" (p. 165).

Continental and British birds were distinguished partly by behavior, partly by banding, and partly by the state of the neck feathers, (since British birds wear off the tips by hole-exploration). Sex was told by eye-color—brownish in males, yellowish in females; by the more pointed throat and breast feathers of the males; and (when the beak is yellow) by the grey base of the mandibles in the male. With adult British Starlings the beak becomes yellow in autumn, with Continental birds not until January or February. Male Starlings were found not to breed until their second year, females in their first year.

The British Starling is markedly sedentary, aside from some wandering in summer by a proportion of the juveniles. In the fall, adult females "all appeared to be paired . . . and the surplus of unpaired males also occupied holes and staked out territories" (p. 227). Some British Starlings roost in their nesting holes throughout the year, while others frequent the communal roosts from June through December. British Starlings go to roost in holes at about the time in the afternoon that Continental Starlings leave for their roosts 15 miles distant; thus British Starlings get less light and less exercise than the Continental birds, yet their gonads develop much more precociously. The author says: "It is known that extra light in winter is capable of stimulating the gonads of starlings to precocious growth (see review by Bissonnette 1936), and it is therefore probable that, in late winter and early spring, the increase in the length of day helps to induce the growth of the gonads in both races of starlings. The variation of the external environment, however, merely helps as a superficial control to render more precise the timing of an animal's internal rhythm, a conclusion which, supported by the evidence obtained from a study of the reproductive cycle of the minnow *(Phoxinus laevis* L.), was put forward by Bullough (1939, 1941)" (p. 236).

The suggestion is made that the gonads of British Starlings seldom regress enough to allow the attachment to the nesting site to be broken. It is otherwise with the Continental birds, who "are released for the southward migration. In late winter and spring, when the gonads grow once more, the birds are induced to return to their nesting areas. Applied to birds in general, this theory, which is certainly oversimplified, means that the basis of the autumn southward migration is negative (the absence of a stimulus), and that of the spring northward migration is positive (the renewal of the stimulus)" (p. 238).

On the basis of the physiological differences between these two populations of Starlings, the author divides them into subspecies, naming the British bird *Sturnus vulgaris britannicus*. He suggests that the behavior of Starlings in this country gives evidence that both races are present. A notable paper, well planned and well executed.—M. M. Nice.

THE DUCKS, GEESE AND SWANS OF NORTH AMERICA. By Francis H. Kortright; illustrated by T. M. Shortt. American Wildlife Institute, Investment Bldg., Wash., D. C. 1942: 6 x 8¾ in., viii + 476 pp., many text figs., 36 color pls. $4.50 (de luxe edition $10.00).

The author of this fine manual modestly disclaims being an ornithologist, and indeed the name of Francis Kortright is probably unfamiliar to many in this field, but if he was not so recognized before, we certainly claim him as an ornithologist now. In a field noted for its profusion of handsome illustrated books, Kortright and Terence M. Shortt (also a comparative newcomer) have, at their first attempt, produced a volume which for combined utility and beauty will stand in the first rank.

There are many new features. The section on sex- and age-determination includes information that will be new to almost any ornithologist. Another section gives the weight, length, and wing-spread (in avoirdupois and inches) of both sexes in each species. These were carefully compiled from a large amount of data including that in many of the large museums. In the case of the male Mallard, the weights given are based on 1,577 individuals! The excellent exposition of the "very simple and extremely important" matter of scientific nomenclature, and the explanation of the pronunciation and meaning of the scientific name of each species, will do much to win converts to ornithology from the ranks of those duck hunters who have supposed that such scientific matters would be too technical to master. The accounts of waterfowl molts and plumages are far more complete and understandable than any hitherto published. There are small maps to show the summer and winter distribution of each native species, but the scale is so small that some of them are very hard to read.

There is an extensive and well-chosen bibliography. However, some of the titles are inaccurate, and many rather incomplete, and therefore difficult to use.

The book is magnificently illustrated. A series of 36 color plates depicts, with two to five plumages each, all North American ducks, geese, and swans, and even some of the hybrids between species. Four plates are devoted to the downy young—a very attractive and intensely interesting series. Unfortunately an occasional plate in the volumes we have seen is somewhat marred by poor printing. A maximum sized image has been secured by filling the page completely with the color plate, but the slightest error in trimming results in clipping the end of a bill or tail here and there. The text is interspersed with drawings which show the characteristics of the various species as they appear when swimming, flying, standing, and sometimes in other poses. These will be very helpful except in the case of the figures of flying Mute and Whistling Swans, which have been accidentally transposed.

We can recommend this book in the highest terms to ornithologists and sportsmen alike.—J. Van Tyne.

WILSON ORNITHOLOGICAL CLUB LIBRARY

The following gifts have been received recently:

William H. Burt: 5 reprints
Lynds Jones: 19 magazines
Leon Kelso: 1 pamphlet
Karl F. Lagler: 2 reprints, 3 reports
Harrison F. Lewis: "The Natural History of the Double-crested Cormorant"
Dayton Stoner: 5 reprints
Lawrence H. Walkinshaw: 10 reprints

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WILDLIFE CONSERVATION

Proposal to Establish Large National Park in Yukon Territory.—On December 8, 1942, the Dominion Government reserved an area of 10,130 square miles along the Canada-Alaska Military Highway, in the southwestern part of Yukon Territory, in order that it may be examined in detail and may be available in its present condition for establishment of a National Park at a later date. This area contains outstanding mountain and glacier scenery, as well as foothills that are the home of a large population of big game, including grizzly bear, mountain goat, Dall's mountain sheep, moose, and Osborn caribou.

Conservation in the National Parks of Canada Attacked and Defended.—The National Parks of Canada are set aside not only as areas devoted to recreational and educational purposes, but also as wildlife sanctuaries, where native wild animals, along with vegetation and the geological formations which contribute to what we call scenery, are to be preserved as far as possible in their natural state, with the influence of man kept to a minimum. Like most policies in a democratic country, this policy is frequently criticized and attacked, especially by persons who want the national parks to produce a maximum quantity of shootable game and who object to conservation of predators such as cougars, wolves, foxes, eagles, hawks, and owls. A recent attack of this kind is found in a paper entitled "Sabotage in the National Parks," published by W. C. Fisher in the issue of *Hunting and Fishing in Canada* for October, 1942. This author claims that "sportsmen are the only true friends of wildlife," that "animals were placed on the earth for the benefit of man," and that "the Parks officials are enamoured with the phrase 'The Balance of Nature.'" He concludes that the National Parks policy with respect to predators must be changed and suggests as a better policy, "Game shall be raised for Mankind," including the tourist, alpine climber, camera man, and sportsman.

A different view of the subject is presented by Professor J. R. Dymond, Director of the Royal Ontario Museum of Zoology, in a paper entitled "Game in the National Parks," which is published in the issue of the same magazine for January, 1943. Professor Dymond points out the need for keeping game populations within such limits that available resources can support them in good condition. He also points out that control by predators, which take the weak and subnormal, tends to improve the game stock, while control by hunters, who seek to kill the finest individuals, tends toward deterioration of the stock. He concludes: "The principle of creating and maintaining National Parks for the preservation of natural life, plant and animal, in representative areas of the different regions of the earth is steadily spreading to all parts of the world."

Publication of a third paper on the subject is promised by the management of the magazine.—HARRISON F. LEWIS.

Golden Eagles and Bighorns

"In the spring of 1940, an eagle's nest was discovered in the very heart of the lambing grounds. Two eaglets were raised in the nest and it was under continuous observation from June 1 to August 1 . . . It need only be said here that no remains of lambs or adult sheep were found . . .

"To date no case of predation by eagles has been seen by a Survey member nor has one been reported for the Crystal Creek area. The conclusion is that eagles may be exonerated of any serious blame for the decline of the Crystal Creek bighorn sheep herd." (Honess, R. F. and N. M. Frost, "A Wyoming Bighorn Sheep study," *Wyo. Game and Fish Dept. Bull.*, 1, 1942: 56.)

"Some eagles nested close to the lambing grounds. One nest was under observation from May 15, at which time the two eaglets were about ten days old, until they left the nest early in July. Pellet examinations and actual observations

during that period indicated that the eagles were feeding on prairie dogs . . . The only other item of food found in pellets or at the nest was a trace of rabbit. These observations are not conclusive, but they do indicate that, in the Tarryall Mountains, the eagle is a minor factor . . .

"No evidence of predation by golden eagles was found." (Spencer, C. C., "Notes of the life history of Rocky Mountain Bighorn Sheep in the Tarryall Mountains of Colorado," *Jour. Mammalogy*, 24, 1943: 9, 11)—F. N. H.

To the Editor of the Wilson Bulletin:

In the December, 1942, issue, Mr. Hamerstrom took exception to a filler which appeared in the Minnesota *Conservation Volunteer* and attempted to "reveal" the true conditions of the Minnesota caribou herd. He was particularly critical of liberating the animals from an enclosure and then opening a part of the refuge to deer hunting this past fall.

Due to excessive rainfall, it was necessary to turn the animals free, for almost all of the corral is swampy and was filled with water during the summer. The area, opened to deer hunting for eleven days this past fall, lies along the north shore of Upper Red Lake, extending eight miles in length and approximately one and one-half miles in width. It amounts to about 7,680 acres. The nearest part of open territory is about five miles southeast from the corral. In upland country this distance may seem relatively short but the strip between the corral and open area is largely muskeg and open swamp which is virtually impassible until frozen. It is not classed as caribou range, for the Soil Conservation Service technicians have mapped the area as potential waterfowl habitat. They also have outlined the suitable caribou range as extending to the north, east and west of the corral in the opposite direction from the area opened to hunting and well within the sanctuary.

During the hunting season every precaution was taken to protect the caribou. An area of 407,700 acres was maintained as an inviolate sanctuary. The boundaries of the new hunting area were posted with special signs calling the hunters' attention to the species and the penalties for killing one. Extra patrolmen were detailed to the area and every hunter they met was cautioned to be alert to prevent shooting any caribou.

The deer season closed without a single mishap to the protected species. Some of the animals were sighted, not in the newly opened area, but to the north and east of the corral. The "blunder" referred to by Mr. Hamerstrom was, indeed, good wildlife management, for if the animals had been left in the corral they surely would have perished. The deer in the newly opened territory received a reasonable thinning down and no damage was done.

The article is an example of the condition which often occurs—that of hue and cry by sincere persons not familiar with the problem and armed with only a part of the facts.

Lansing A. Parker
Division of Game & Fish
St. Paul, Minnesota

I criticise only the deer hunting so close to the point of the caribou release. It is axiomatic that one should expect wild animals, upon release from confinement, to make extensive movements of an exploratory nature. As a corollary, one should expect these movements to include areas of unsuitable range. No one knows exactly what caribou do under these circumstances: too few transplantings have been made. The conservative policy, therefore, would have been to admit the likelihood of such a movement and to safeguard it in every practicable way, recognizing that muskeg and swamp is no barrier to caribou and that the well-meaning of most hunters is no guarantee against accidents.—F. N. Hamerstrom, Jr.

Exotic Game Birds

Ralph T. King has ably discussed the problem of exotic game birds in his article "Is it wise policy to introduce exotic game birds?" (*Audubon Magazine*, 1942, 44:136–145, 230–236, 306–310). His conclusions were:

"(1) Economically the introduction of foreign species has been and undoubtedly will continue to be highly expensive. (2) The number of well intentioned introductions that have resulted in establishment of the introduced species and have since proven to be non-beneficial if not actually injurious is equally as great as the number that have been proven to be desirable. (3) Introductions resulting in establishment always create heavier demands on both foods and coverts, may involve the introduction of new parasites and diseases, and may result in cross-breeding to the detriment of closely related native stock. Furthermore such introductions do not necessarily result in reducing the hunting pressure on diminished native species. (4) Introductions of additional animals into exhausted or deficient environments can only result in the loss of the animals and further deterioration of the environments. (5) Introduced species can and have increased to pest proportions. (6) We cannot be sure of the population behavior, food habits and degree of spread of any introduced species until *several* years after the species has become successfully established. (7) Any successful introduction must inevitably change natural associations and the native fauna to some extent. We cannot tell to what extent until the introduced species is established. (8) Unfortunately we have not taken advantage of our opportunities and as a consequence have learned relatively little about the costs and results of introductions."—F. N. H.

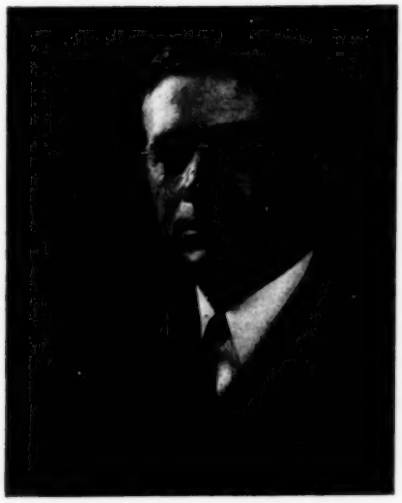
WILDLIFE CONSERVATION COMMITTEE
Frederick N. Hamerstrom, Jr., Chairman

NEW LIFE MEMBERS

We take this opportunity to introduce to the Wilson Club three of our new Life Members: George B. Thorp, George H. Lowery, Jr., and Bernard W. Baker. Others will be presented in subsequent issues of the *Bulletin*. We hope the Endowment and Membership Committees will keep us supplied with candidates for indefinite continuation of this series.

GEORGE B. THORP, a former professor of aeronautical engineering at the Carnegie Institute of Technology, has made a hobby of ornithology for many years. He has been president of the Audubon Society of Western Pennsylvania for the past three years; is a leader and one of the sponsors of the Pymatuning Group, whose interest centers in the Pymatuning Wildlife Refuge in northwestern Pennsylvania; is Chairman of the Endowment Committee of the W.O.C.; is a member of the A.O.U., the National Audubon Society, and the Sewickley Valley Audubon Society. He has been engaged in Americanization work in connection with refugees, under the sponsorship of the American Friends Service Committee.

GEORGE H. LOWERY, JR., is Curator of the Museum of Zoology of Louisiana State University. He received the Master of Science degree from that institution in 1936, at which time the University established a zoological museum under his direction. He was appointed Curator and later Assistant Professor in Zoology, a position which he now holds. Since the establishment of the Museum of Zoology in 1936, thousands of birds, mammals and other vertebrates have been assembled by him and his students. His chief ornithological interests are in taxonomy and distribution, particularly in relation to the lower Mississippi Valley and certain sections of Mexico. He is a member of the A.O.U., and is affiliated with the Cooper Ornithological Club and various other scientific organizations.



BERNARD W. BAKER is a former dairy farmer, jack of all trades, successful chain store owner and operator, whose hobbies are ornithology, running a seventy-five acre bird and wildlife sanctuary in Ottawa County, Michigan, taking kodachrome slides of bird and wildlife, and lecturing to nature groups and schools. He is a member of the A.O.U., the National Audubon Society, and the Michigan Audubon Society.

ANNUAL REPORTS

REPORT OF THE TREASURER FOR 1942

Despite rising prices and the difficult conditions which have caused the loss of many members, our balance is larger than a year ago. This is due to the generous donations of time and energy by the editors, secretary, and membership chairman, and to the constant economies practiced by these officers as well as to the loyalty of the members. The auction of paintings donated by President Sutton was responsible for $159.50 of our present balance.

Balance as shown by last report dated Nov. 22, 1941	$ 42.04	
Receipts Nov. 17, 1941 to Dec. 31, 1942		
Dues:		
Associate	1,185.35	
Active	970.09	
Sustaining	200.00	
Subscriptions to the *Wilson Bulletin*	99.00	
Contributions	325.41	
Sale of back numbers of the *Wilson Bulletin*	179.00	
Miscellaneous Receipts	5.10	
TOTAL RECEIPTS		$3,005.99

Disbursements:

The *Wilson Bulletin:* printing, engraving, mailing	$2,001.42	
Editor's expense: postage, mailing	60.09	
Secretary's expense: stationery, postage, clerical aid	159.10	
Treasurer's expense: postage, printing, clerical aid	79.65	
Membership Committee expense: postage, printing	151.83	
Annual meeting of 1941: programs, badges	122.02	
Bank charges	47.18	
Bad checks returned	17.03	
Subscription refunds on erroneous orders	12.70	
Miscellaneous: reprints, purchase of old *Bulletins*	20.49	
TOTAL DISBURSEMENTS		$2,671.51
Balance on hand in St. Anthony Park State Bank, St. Paul, Minnesota. Dec. 31, 1942		$ 334.48

ENDOWMENT FUND

The endowment fund made substantial increases during the year as a result of the activities of the Endowment Committee, and because we received during the year a bequest, the first during the present treasurer's term of office. The income from the endowment fund is used entirely for improving *The Wilson Bulletin.*

Bonds on deposit in safety deposit box, St. Anthony Park State Bank, St. Paul:		
U.S. Postal Savings Coupon Bonds dated July 1, 1935	$780.00	
U.S. Savings Bonds, maturity value May 31, 1945 $900.00, purchase value	675.00	
U.S. Savings Bonds, maturity value Aug. 1, 1948 $1,075.00, purchase value	806.25	
Balance in savings account, St. Anthony Park State Bank, Oct. 1, 1941	142.26	
Received during year:		
Interest on U.S. Postal Savings Coupon Bonds	39.00	
Interest on savings account	3.79	
Contribution	5.00	
Bequest from estate of Marcia Clay, deceased member	100.00	
New Life Members	525.00	
Balance on hand in savings account, St. Anthony Park State Bank, St. Paul, Minnesota, on Dec. 31, 1942		$ 815.05
Total endowment fund, savings account and bonds at purchase value		$3076.30

Respectfully submitted,

December 31, 1942 GUSTAV SWANSON, *Treasurer*

REPORT OF THE SECRETARY FOR 1942

Once again the orderly procedure of the Wilson Ornithological Club has been interrupted by war. The annual meeting for 1942, scheduled for Ithaca, New York, was postponed, nor have any definite plans been drawn for further meetings until after the emergency is over.

The Club closed its year (as of December 1) with a membership of 1,054. During 1942 we lost 293 members and gained 166 new ones, the net loss being 127 members. The greater part of this loss is, the secretary believes, directly attributable to the war. We now have more than a hundred of our members in the armed services, and more are constantly being called up. Another factor contributing to the decrease in membership was the omission of the annual meeting. These meetings have always been important in attracting new members.

As in other recent years the Club owes a heavy debt of gratitude to Richard L. Weaver, and to the members of his Membership Committee. They have been unflagging in their work of solicitation, and fertile in devices for finding new members. Largely through their efforts, our membership has grown considerably in New England and in other eastern states.

Faced with the necessity of conducting the Club's election and other business by mail, the president, George M. Sutton, appointed a nominating committee consisting of Margaret M. Nice, Chairman, H. L. Stoddard, and Jesse M. Shaver. This committee published its report in the December *Wilson Bulletin*, nominating a slate of candidates as follows:

President: George Miksch Sutton
First Vice-President: S. Charles Kendeigh
Second Vice-President: Olin Sewall Pettingill, Jr.
Secretary: Maurice G. Brooks
Treasurer: Milton B. Trautman
Councillors: Burt L. Monroe, Eugene P. Odum, Lawrence H. Walkinshaw

All members of the club were invited to vote for officers, either from the suggested slate, or as they otherwise chose. All ballots received by the secretary have been in ratification of the committee's slate, and the election of the officers named above is hereby certified. The Club's constitution places the responsibility for electing an editor on the Council; this election has been held, and has resulted in the unanimous selection of Josselyn Van Tyne to serve during 1943.

Late in the year George M. Sutton was commissioned a captain in the United States Army, and has been forced to give up temporarily the active direction of Wilson Club affairs. In his absence S. Charles Kendeigh becomes acting president for 1943. O. S. Pettingill, Jr., automatically becomes acting first vice-president. Another member of the Council, Burt L. Monroe, is also now in active military service.

The Secretary wishes to express his sincerest thanks to those who have helped him, and have borne with his many shortcomings during his first year in office. It has been a trying period, and there have been many delays, seemingly unavoidable. He hopes sincerely that every member of the Club will feel a personal interest in maintaining the membership of the organization, and in contributing to its continued progress.

Respectfully submitted,

March 2, 1943 MAURICE G. BROOKS, *Secretary*

REPORT OF THE ENDOWMENT FUND COMMITTEE

During the past year this newly constituted committee, after preliminary discussions, came to substantial agreement as to the nature of the campaign to be conducted for additional endowment, and laid plans for a long range effort. An initial statement was made in the June *Bulletin*; and as it was generally considered that conditions did not warrant sending out a letter to the entire membership on the subject, a fuller statement with a more direct appeal was inserted in the December *Bulletin*.

In the meantime the membership was apportioned on a geographical basis to the members of the committee for making personal appeals; and while this work has as yet only begun, and has hardly touched some regions, nevertheless at least six new Life Memberships have come in. As was to be expected, the committee's work has suffered by reason of the war. One of its members has been called to service, others are finding less time for non-war work, and it is proving more difficult to interest the membership in such matters. It is hoped that as members pay their 1943 dues they will give serious consideration to transferring to the Life Membership class.

Respectfully submitted,

February 26, 1943 GEORGE B. THORP, *Chairman*

REPORT OF THE ILLUSTRATIONS COMMITTEE

The present chairman took office in January, 1942, and the following members agreed to serve on the committee—Roger Peterson, Karl Maslowski, Richard Grossenheider and T. M. Shortt.

The exact functions of the recently formed Illustrations Committee were very nebulous, and the committee's operation this year has reflected this uncertainty. It is sometimes difficult for such a widely dispersed committee to function quickly enough to provide the answer to problems which arise late in the editing of a given *Bulletin*. The committee, however, has been able to be of some assistance to the editor. We aided in securing illustrations for the September issue of the

Bulletin. Some illustrative materials for other issues were submitted to the chairman for criticism, and ideas have been exchanged with the editor regarding illustrations in past issues. A list of artists and photographers who have offered materials for use as illustrations in the *Bulletin* has been compiled.

The committee suggests that a file of the species of birds for which various artists or photographers have illustrative material available for use in the *Bulletin* would be of value to the editor. The compiling of such a file would be a constructive function for succeeding Illustrations Committees.

Respectfully submitted,

February 15, 1943 W. J. Breckenridge, *Chairman*

REPORT OF THE COMMITTEE ON AFFILIATED SOCIETIES

At the 1941 annual meeting the affiliation of the Inland Bird Banding Association, the Virginia Ornithological Society, and the Georgia Ornithological Society was formally completed. The Wilson Club heartily welcomes these organizations to affiliation and believes that the association will be of mutual benefit.

The matter of affiliation with our organization was referred to committee by the Wisconsin Society for Ornithology at their annual meeting in April, 1942. A vote will be taken at the coming annual meeting in April at Waukesha.

The committee will welcome any suggestion for the development of affiliation activities and the names of groups that might be interested in affiliation.

Since the annual meeting of 1941 Burt L. Monroe and George H. Lowery, Jr., acted successively as chairman of this committee, but the exigencies of war and other matters forced them to relinquish their duties.

Respectfully submitted,

February 12, 1943 Gordon M. Meade, M.D., *Chairman*

The Wilson Bulletin Publication Dates

The actual dates of publication of the four numbers in 1942 were: March 23, June 22, September 23, December 31.

TO OUR CONTRIBUTORS

Our members are asked to submit articles for publication in the *Bulletin*. Manuscripts will be accepted with the understanding that they have not been published or accepted for publication elsewhere.

MANUSCRIPT. Manuscripts should be typed on paper of good quality and of letter size (8½ x 11). Write on one side only and use double spacing. The title should be brief and carefully constructed so as to indicate clearly the subject. Ordinarily the scientific names of the birds treated should be given and should appear early in the article. Most articles should have a brief summary at the end.

ILLUSTRATIONS. Photographic prints, to reproduce well as half-tones, should have good contrast and detail. Please send prints unmounted, and attach to each print a brief but adequate legend. Do not write heavily on the backs of photographs.

BIBLIOGRAPHY. Literature cited should ordinarily be listed at the end of articles. These citations should be complete and references to them in the text should be made by the year of the citation and the exact pages referred to.

PROOF. Galley proof will be submitted to authors and must be returned promptly. Expensive alterations in copy after the type has been set must be charged to the author.

REPRINTS. The Club is unable to furnish free reprints to authors. Arrangements will be made, however, for reprints to be made at cost. A scale of costs, based on the number of pages, is given below. Orders for reprints should accompany the returned galley proof. Charge will be made for a minimum of 100 reprints.

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